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Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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EDITOR: Michael Freemantle
PRODUCTION EDITOR: Cam Appleby

All correspondence to be addressed to The Editor, Chemistry International, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, England (telephone: + 44 (865) 717744).

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Front cover: The National Palace of Culture, Sofia, Bulgaria, venue of the 31st International Congress of Pure and Applied Chemistry.

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Editorial

An abundance of chemical wisdom

IUPAC sponsors about 30 international conferences, symposia and congresses each year. A glance through the Conference Calendar section of this issue of *CI* will show that most of these meetings are devoted to specialized topics. For example, in July 1988 there are sponsored conferences on the following topics: organic synthesis, modified polymers, macromolecules (twice), photochemistry and poly(vinyl chloride). The number and variety of conferences in August 1988 is even greater.

Whereas most IUPAC-sponsored conferences are specialized, the IUPAC International Congresses of Pure and Applied Chemistry are different in that they cover all branches of the subject. The congresses are held every two years — during the General Assembly year — and they bring together specialists in the various branches of pure and applied chemistry from all over the world. Chemists are thus able to learn not only about developments in their own field but also — particularly through the plenary lectures — about the state of the art in other specializations.

These congresses are therefore unique and the Union places a great deal of importance on them. For example, where else could you meet, in a single gathering, chemists from such geographically distant countries as the Arab Republic of Egypt, Australia, Canada, Finland, France, India, Japan, Netherlands, Poland, Soviet Union, Sweden, Tunisia, United States and Yemen Arab Republic and at the same time hear lectures on such diverse topics as superconductors, the hydrogen economy, tumour phototherapy, chemistry for decision making, liquid crystalline polymers, ceramic phase transitions and chemical education in Bulgaria.

The scientific programmes of these congresses are thus rich and varied. On the opening day of the 31st IUPAC Congress held in Sofia, Bulgaria 13–18 July 1987, IUPAC President "Ram" Rao informed participants that the word Sofia means wisdom. Participants at the Congress certainly experienced an abundance of chemical wisdom at the Congress.

About 1700 chemists from 44 countries attended the 31st IUPAC Congress in Sofia.

Opinions expressed here are those of the author and do not necessarily reflect the views or policy of IUPAC.

Yogurt stops the rot?

In various Sofia hotels during the week of the IUPAC Congress, participants could be observed consuming copious portions of natural yogurt at breakfast time. I was assured that not only were these participants enjoying the delicate flavour of this local food, but they were also adding years to their life. No doubt these participants were aware of the work of the Russian biologist Elie Metchnikoff.

In the late 19th century, Metchnikoff, whilst working at the Pasteur Institute in Paris, suggested that the deterioration of the human body was influenced by putrefactive bacteria that produced toxins in the large intestine. Metchnikoff put forward the theory that these bacteria could be suppressed by promoting the growth, in the intestine, of the lactobacilli in yogurt.

Yogurt is made from concentrated milk and is soured by the bacillus *Lactobacillus bulgaricus* (note the word *bulgaricus*). For centuries, it has been a staple part of the diet in the Balkans where the population has been noted for its health and longevity.

News & Views

IUPAC awards in Canada

In 1982, the Canadian National Committee of IUPAC established the CNC–IUPAC Awards. The main purpose of the awards is to assist young scientists, who are beginning to have an international impact on their field, to actively participate in international meetings sponsored by IUPAC. The awards also provide international exposure for Canadian science. While the age of the awardees is expected to be in the range of 35 to 42 years, nominations of younger people who have made substantial original contributions to chemistry are encouraged. Each award covers the winner's expenses to contribute a paper at an IUPAC conference outside North America. The value can be in excess of $2000.

The 1987 winners were Michael Blades of the University of British Columbia, Stanley Brown of the University of Alberta and Hector Casal of the National Research Council. They attended the 31st International Congress of Pure and Applied Chemistry in Sofia, Bulgaria.

Hector Casal, one of the CNC–IUPAC Award winners, at the 31st IUPAC International Congress of Pure and Applied Chemistry, Sofia, Bulgaria in July 1987.

Three of the participants at the 25th International Conference on Coordination Chemistry held in Nanjing, China from 26 to 31 July 1987. From left to right: Henry Taube (who won the Nobel Prize for Chemistry in 1983), You Xiao-Zeng (Secretary of the 25th ICCC) and Stanley Kirschner (Permanent Secretary of ICCC).

Breathes there a speaker

"Breathes there a speaker with soul so dead,
Who never to himself hath said,
As he hears his name from the podium read,
I wish to hell I stayed in bed!"

From "Tips on Talks" by H. Edward Clifton in *Chemistry in New Zealand*, p. 59, June 1987.

Analysis of Oils and Fats Workshop

A Workshop on the Analysis of Oils and Fats, sponsored by the Commission on Oils, Fats and Derivatives (VI.3) and arranged in conjunction with the Department of Chemistry, University of St Andrews and the Laboratory of the Government Chemist, London, UK, will be held at the University of St Andrews, Scotland, from 22 to 24 August 1988.

The purpose of the workshop is to present modern analytical techniques applicable to the analysis of oils and fats, and to follow these with practical demonstrations.

Members of all IUPAC commissions are invited to attend and will be eligible for a reduced participation fee. Intending participants may, upon request, assist either in the presentation of the methods of analysis/techniques or their demonstration. Contributions for short papers dealing with new analytical methods and techniques are also cordially invited.

Further information is available from: Mr W. D. Pocklington, Secretary of IUPAC Commission VI.3, Laboratory of the Government Chemist, Cornwall House, Waterloo Road, London SE1 8XY, England. Deadline for sending completed forms is 31 January 1988.

Antarctic science

The proceedings of a workshop on "Future Directions for the Management of Antarctic Science" has been published. The workshop was convened by the International Institute for Environment and Development (IIED) and held at the Wingspread Conference Center in Racine, Wisconsin, USA.

The report was prepared by Lee A. Kimball, IIED, 1717 Massachusetts Avenue, N.W., Suite 302, Washington, DC 20036, USA. Tel: +1 (202) 462 0900. Telex: 64414 IIEDWASH.

The pig: answer to tomorrow's energy problems? (See p. 15).

A typical day in the life of Prof. Edward Grzywa

Prof. Edward Grzywa is a Cabinet Minister in the Polish Government and an Associate Member of the CHEMRAWN Committee. When he attended the CHEMRAWN VI Conference held in Tokyo in May last year he told *Chemistry International* about his career and also described a typical working day in his life.

Since February 1982, I have been Minister of Chemical and Light Industries in Poland and therefore a member of the cabinet in the Polish government. I am also Professor of Polymer Technology at the Technical University in Warsaw — a post which I have held since 1973.

I was born in February 1933. I obtained an MSc in Polymer Chemistry in Moscow in 1956. From 1957 until 1966 I worked in the chemical industry at Oświęcim (Auschwitz). During this time I spent one year on a postgraduate course at the London National College of Rubber Technology. In 1967, I received a PhD in chemistry at Gliwice Technical University (Poland).

Following my PhD I moved to Warsaw as Director of the Industrial Research Institute of Organic Chemistry and stayed in this post until 1978. From 1978 until 1980 I was Director of Research at the Institute of Industrial Chemistry in Warsaw. I then became Deputy Minister of Chemical Industry in 1980 and Minister in 1982.

My work has resulted in the publication of about 50 papers and 110 patents in Poland and abroad. I have also just finished writing the first volume of a work on chemical technology. This volume, which is about raw materials, will be published at the end of this year. The second volume, which is about organic chemical technology, will be published next year.

As far as IUPAC activities are concerned, I was a Member of the Organizing Committee of the IUPAC Congress held in Warsaw in 1977. Since 1984, I have been an Associate Member of the CHEMRAWN Committee. I have attended all the CHEMRAWN conferences — apart from the one held in Manila, Philippines in 1982. I am certainly very committed to CHEMRAWN and every conference I have attended has been of immense value to my work. CHEMRAWN VI on Advanced Materials for Innovations in Energy, Transportation and Communications is particularly important since new advanced materials are making a major impact in the chemical and allied industries in Poland.

Prof. Grzywa at CHEMRAWN VI, Tokyo, May 1987.

My working day

I normally get up about 6.50 am and I am usually in my office by 7.50. The office opens officially at 8.15 and I am responsible for a staff of 500 at the Ministry. My wider responsibilities include 950 000 people who work in the chemical and light industries and the 848 enterprises which make up these industries. They include chemicals, textiles, cellulosics, paper, glass and ceramics.

Chemical industry is growing rapidly in Poland. Our aim is to modernize the entire chemical industry. We are looking for joint ventures with other countries and we now have the legislation to do this. We are hoping to attract foreign capital and technology in these joint ventures in order to speed up the development of these industries. We have many well-trained chemists, some of whom have received postgraduate training in the West. One of our problems is the lack of workers — chemical process operators for example. We hope to overcome this problem by increasing the efficiency of the workers. This is one of the most important jobs of the chemists and chemical engineers in our industries. At present chemicals account for about 8% of the total value of our industrial production.

I attend various government and industrial meetings in Warsaw each week and about twice a week visit plants in different parts of Poland. I make short visits to other countries about eight or 10 times a year. These are mainly visits to socialist countries such as the USSR and Czechoslovakia. However, I also visit other European countries. This is my first visit to Japan. I am impressed by the warm hospitality of our hosts in Tokyo and the conference has certainly been extremely well organized. I

have been to the USA several times and hopefully will be able to attend the General Assembly in Boston.

Getting back to my work in Warsaw, our office at the Ministry closes at 5.00 p.m. However, I usually stay on in the office until 9.00 or 10.00 p.m. — reading, writing, planning and thinking about the future of our industry. I work six days a week although on Saturday I usually leave the office between 5.00 and 6.00 p.m.

I am lucky that I live only 8 km from my office and can travel the distance in about 15 minutes. On Sundays I relax with the family by working in the garden and listening to music on a compact disc system. My favourite composers are Beethoven, Tchaikovsky and Mozart. I am particularly fond of Chinese food although I rarely have the opportunity of eating it. I eat a lot of cheese and drink litres of milk. My elder daughter is studying chemistry at the Technical University in Warsaw and our younger daughter is finishing school this year. She will be going to Warsaw University. Both my daughters live at home with us. My wife is a medical doctor.

Intelligent molecules

Viktor Gutmann and Gerhard Resch

The properties of molecules are partly subject to the conditions of their environment. "Intelligent molecules" are able to maintain their main characteristics under different conditions. Their ability to adapt depends on the organization of the molecular system. This article explores new frontiers of the molecular concept and aims to encourage qualitative investigations into molecular system organizations.

Atoms and molecules as parts of the continuum

The view that matter is a continuum, completely filling the Universe, is associated with the Eleatic School of Greek philosophy, founded by Parmenides. This view was strongly supported by Aristotle (374–322 BC).

A second view — the "Atomic Hypothesis" was ascribed to Leukippos (about 500 BC). Its great usefulness was demonstrated by Dalton (1766–1844), who formulated the quantitative relationships which led to the determination of atomic weights with high accuracy. It is a matter of fact that modern chemistry has developed on the basis of this concept.

However, quantum mechanics has revealed that discrete atoms (as isolated entities) cannot be found because of the continuous relationships of the undivided Universe. The lack of discrete border lines within the continuum (as a continuum) makes it impossible to observe or to measure directly the properties of the continuum.

Modern science has developed techniques by which the limitations of sensual perceptions can be exceeded. For example, a piece of metal can be readily seen, as it appears sharply separated by border lines from other objects. For the naked eye the metallic material appears homogenous. Observations by the microscope (as an extension of the faculty of the eye) reveal, however, that it contains many small grains, separated from each other and connected to each other by the so-called grain boundaries. When a sample of the metal is observed by means of an electron microscope, dislocations and in some cases even so-called point defects can be detected and located, as new border lines become apparent. X-rays are diffracted by the so-called electron shells. These are border line areas between the highly condensed areas of the continuum, known as the atomic nuclei and the highly diluted interatomic areas of the continuum. Thus, the electron shells provide borders between vastly different regions of the one undivided continuum[1].

Prof. Viktor Gutmann (Institut für Anorganische Chemie, Technische Universität Wien) was President of IUPAC's Inorganic Chemistry Division, 1973–1975. Viktor Gutmann and Gerhard Resch are the authors of a book entitled *Scientific Foundations of Homoeopathy* published by Barthel & Barthel, Berg am Starnberger See, FRG, 1987. ISBN 3-88950-047-1.

As each small area of highly density in mass and in positive electric charge (the atomic nucleus) is completely surrounded by borders, the former is considered as the inner part and the latter as the outer part of one entity, the atom. Thus, an atom is an intelligible part within the directly observable continuum. Theoretically an atom may be treated as an entity, but it is actually impossible to separate it from the continuum[2]. Thus, atoms as isolated entities have no longer a meaning in the classical sense[3].

Quantum mechanics describes the whole Universe as a fluctuating charge density pattern, in which atoms and molecules are embedded without classical border lines. The fundamental problem has been formulated by Stapp[4]: "The observed system is required to be isolated in order to be defined, yet interacting in order to be observed". Einstein, Podolsky and Rosen[5] have clearly shown that any change in one region is bound to have consequences for the whole system.

Most philosophers have agreed that in order to account for what is observed, it is necessary to infer what is not observed. Bohm[6] says: "The original and creative insight within the whole field of measure is the action of the unmeasurable". Whyte[7] points out: ". . . some readers of this essay will live to see a new picture of the unseen world. They are to be envied . . . if a future theory is to unify atomic knowledge, it must contain all established theories as particular cases . . . it must grow out and must subsume the achievements of atomism".

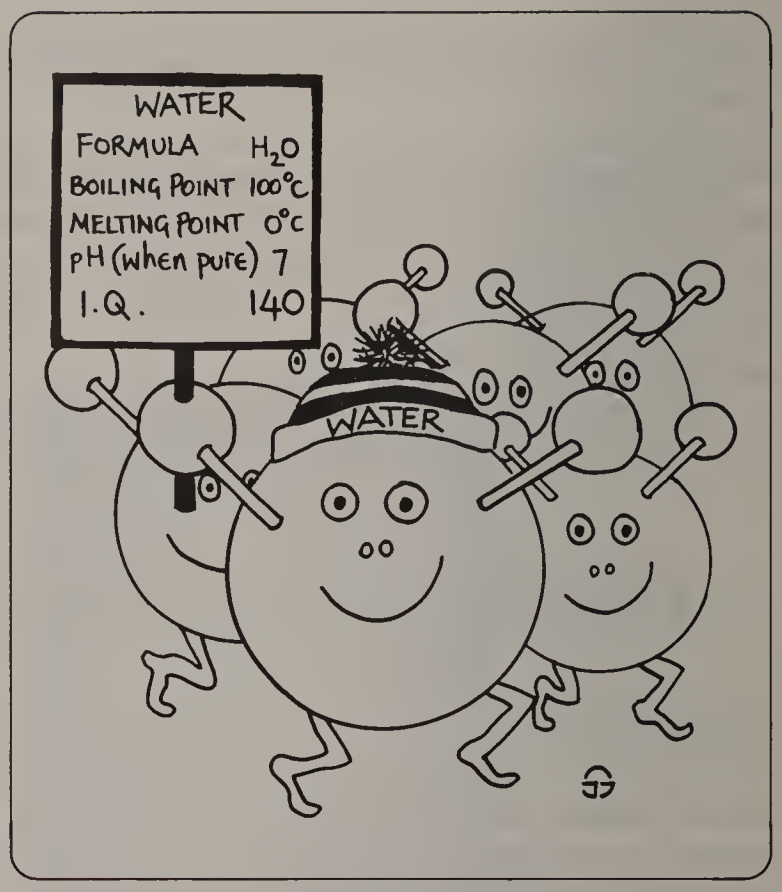
In the attempt to look for such a new picture, it may be recalled that (i) like most scientific theories atomism successfully treats the quantitative aspects without explaining adequately the qualitative features and (ii) measurable quantities require the existence of qualities which cannot be measured as such. This means that proper attention should be paid to all qualitative aspects that are accessible.

Qualitative considerations

In order to make observations, it is necessary that the system has the ability to react specifically towards changes in the environment without losing its main characteristics. Eigen and Winkler[8] referred to molecules with particularly well-developed abilities to maintain their main characteristics under different conditions as "intelligent molecules". In this way they tried to express the fact that the properties of molecules are partly subject to the conditions of the environment and that knowledge of structures and properties of "single" molecules is not sufficient to account for their actual behaviour.

In order to maintain the main characteristics in different environments, the molecules must be subject to system organizations without which no regularities could be found.

Molecular system organization requires a highly developed differentiation within each molecular species. The Pauli-principle expresses the differentiation of the electrons within an atom. According to



quantum mechanics, the probability of finding an electron at infinite distance from the nucleus is not zero. Thus, an atom has no border line within the fluctuating charge density pattern. Each "point" within this network is always in a certain state of tension, and this varies from time to time. It is therefore impossible to find two parts, such as electrons, atoms or molecules which are absolutely equal in all properties. All said equalities refer to the statistically derived quantities for virtually unequal, although similar parts. Statistical equality is required for expressing quantitative aspects, but is unsuitable in order to account for the qualitative properties of individual entities. Instead, in qualitative science the only ordering criterion is provided by similarity considerations.

"Knowledge of structures and properties of 'single' molecules is not sufficient to account for their actual behaviour."

As chemistry is in the first place concerned with changes in qualities, it has actually been developed mainly on the grounds of similarity considerations. For example, nitric acid and acetic acid are quite different, but similar in that each of them has acidic properties. Even these are different, the former being considered a strong acid and the latter a weak acid. Likewise, acetic acid and hydrofluoric acid are quite different, and yet similar in acidic properties, as expressed by similar values of the acidity constants.

Various similarity rules have been established and found useful for chemists. Examples are the so-called solubility rules (polar solutes dissolve in polar solvents,

non-polar solutes in non-polar solvents, and metallic solutes in metallic solvents) and the rules for the interactions between Lewis acids and Lewis bases (hard–hard interactions as well as soft–soft interactions lead to more stable products than hard–soft interactions). Less known is the fact that the "polarity scale of the elements", proposed on the ground of similarity considerations by Berzelius, corresponds to the electronegativity scale[9].

All conclusions by analogy and all homology considerations are based on similarities. It can be said that chemistry and biology (even including molecular biology) would not have been developed without similarity considerations.

It is therefore unjustified to regard such qualitative results as scientifically inferior to quantitative data. Instead, both qualitative and quantitative considerations are important in order to gain scientific knowledge. The establishment of the periodic table is an example of the need for joint consideration of qualitative and quantitative aspects. Fifty years before its establishment, Döbereiner had noted similarities between elements which he grouped together (Döbereiner triads). Mendeleev arranged the elements according to increasing atomic weights, and grouped them according to similarity considerations. Similarity considerations even allowed him to predict properties of elements hitherto undiscovered.

Mendeleev's procedure

Whereas synergetics[10] attempts to construct the complex behaviour of systems from the properties of its parts and their interactions in a mathematical way by the use of non-linear equations the present approach is meant to disclose the ordered relationships, as they pre-exist in nature.

As molecules react in highly specific ways towards changes in environment, the differences between the parts cannot be coincidental. Instead, differences are required for the observed regularities. Because the differences are not directly accessible, we suggest starting with the wealth of qualitative observations and of experimental data for the system under consideration, and paying full attention to all differences that can be noted in behaviour and properties under different conditions. Even small differences between systems or within the systems may provide valuable information with regard to the system organization. In particular we even have to consider results which appear anomalous or curious. Such results do not meet expectations from theoretical considerations or model assumptions, and hence these results may indicate the shortcomings of our interpretations rather than "inadequacies" of nature[2].

One should not entirely ignore the results which are not strictly reproducible. Poor reproducibility is frequently a consequence of differences in system organization due to unknown factors. Knowledge of these may be important in order to disclose the system organization. All available observations should be considered, such as structural, spectroscopic, thermodynamic, kinetic properties in different environments (solvents etc.) at different temperatures and pressures, under the influence of radiation, fields, mechanical actions etc[2].

The various facts may be ordered by following Mendeleev's procedure: the parts of the system may be arranged according to differences in quantitative properties and grouped together according to similarities in qualitative properties. In this way "hierarchic levels" are introduced within the system under consideration, which remain actually integrated within its continuity. The different hierarchic levels are chosen in such ways as to express certain differences in dominance between them and to provide an orientation for further questions.

This approach may be applied to any material system. It may be briefly illustrated by considering tris-phenanthroline–iron complexes[11].

Phenanthroline–iron complexes

Tris-phenanthroline–iron complexes are known to undergo redox reactions:

$$\underset{\substack{\text{red}\\ 3d^6\\ \text{diamagnetic}}}{[\text{Fe(II)(phen)}_3]^{2+}} \rightleftharpoons \underset{\substack{\text{blue}\\ 3d^5\\ \text{paramagnetic}}}{[\text{Fe(III)(phen)}_3]^{3+}} + e^-$$

It is assumed that the electron density at the iron nucleus is greater in the reduced than in the oxidized form, and that they differ in Fe–N distances. However, the Mössbauer isomer shifts reveal hardly any differences in Fe–N distances. Calculations by means of a quasi CNDO/2-MO-SCF method have shown that changes in charge distributions, due to changes in substituents and redox state, are distributed over the ligands, whereas the Fe coordination centre remains nearly unaffected (Fig. 1)[12].

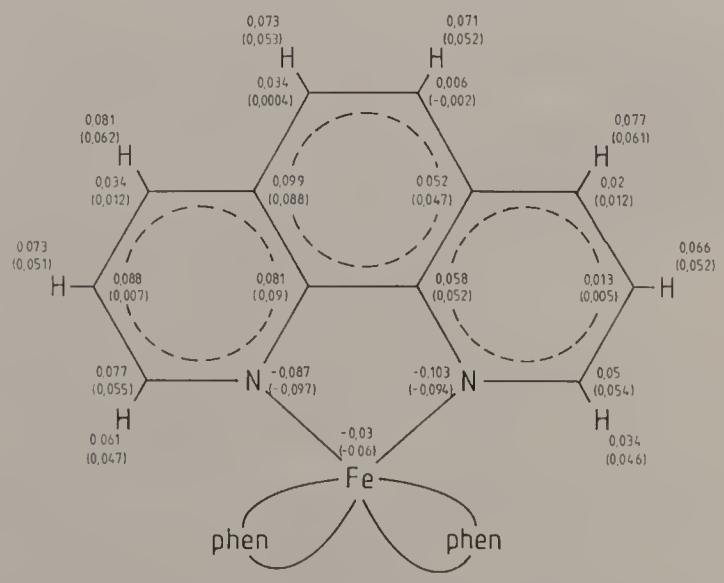


Fig. 1. Results of quantum-chemical calculations for the blue and (in brackets) red tris-phenanthroline iron complexes.

By considering further (i) the solvent and substituent effects on the rate coefficients, (ii) the existing isokinetic relationships[13] and (iii) the polarographic results[14], the conclusion is reached that phenanthroline–iron complexes have an unusually well-developed ability of adapting themselves to different environmental conditions, without losing their integral configuration.

The greatest invariance towards different conditions is found for the charge density region within the FeN_6 group. This group appears, nearly unaffected by electron changes itself, to redistribute the charge density within the whole system. Structurally this group may be considered as the inner region of the pockets provided by the phenanthroline ligands, which are particularly active in interactions within the environment. For example, water molecules within the pockets may act as bridging units between the molecular centre and the molecular environment.

All of the said properties suggest that each FeN_6 group is a regulating centre, and hence at the highest accessible hierarchic level. Immediately subordinated to this level appear the peripheral regions of the ligands, which are essential for the communication with the environment. All other electron areas of the complex entity appear subordinated to this level[11]. The more pronounced dynamic aspects of the superior levels are necessary in order to maintain the structural framework (provided by the lowest hierarchic level), which provides the boundary conditions for the execution of the dynamic functions of the higher levels.

The π–electron systems of the aromatic rings show greater mobilities than their σ-bonded structural framework. According to the circumstances, the former must be capable of executing either donor- or acceptor-functions towards other areas[12], and hence they appear to play a decisive role within the system organization by exercising "buffer functions" between the higher levels and the structural framework. It is therefore justified to consider the π–electron system as serving on a level intermediate between that of the outer regions of the unit and its structural framework (Fig. 2)[11].

Nevertheless, there seems to be an uncertainty with regard to a complete knowledge of any molecular system organization. With regard to the systems under consideration, it is impossible to account for all details concerning (i) the differentiations within the electron areas of the FeN_6-group, (ii) the differentiations and oscillations in the peripheral regions, and (iii) the variations in the π–electron systems[2,11].

System organizations in biological systems

The behaviour of haemoglobin — as explored in much detail by Perutz[15,16] — provides an example for the dependence of a molecular system from its boundary conditions and for the fact that the system organization serves a highly specific purpose, namely to carry oxygen from the lungs to the tissues and to provide the conditions for the transport of carbon dioxide from the tissues to the lungs.

The haemoglobin molecule is made up of four polypeptide chains, each of them harbouring one haem, which gives blood its red colour. The haem consists mainly of a porphyrin ring with an iron atom above its centre, which is situated within a pocket of the haemoglobin molecule.

"The distribution of oxygen among the haemoglobin molecules follows the biblical parable of the rich and the poor."

By coordination of oxygen to an iron atom, the latter is pushed into the plane of the porphyrin ring, and an electron drift is induced throughout the molecule. As oxygen is coordinated, the molecule is transferred from the paramagnetic into the diagmagnetic state. It has been shown that in the course of the transition an optimal state in system organization is passed, in which the static and the dynamic aspects of order appear to be well balanced[17]. In this transition state the system has optimal adaptability toward the environment, while maintaining its integrity over a wide temperature range (from 35° to 42°C).

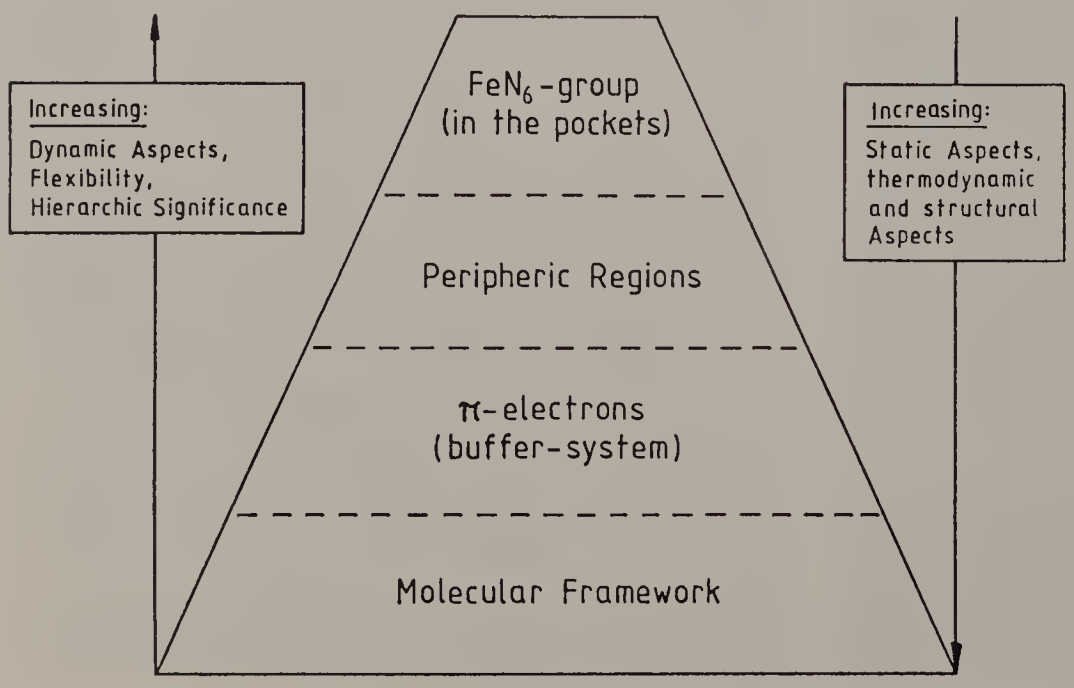


Fig. 2. Illustration of the system organization in tris-phenanthroline iron complexes.

In an iron–dioxygen complex, which has a similar Mössbauer spectrum to oxyhaemoglobin, a crystallographic two-fold rotation axis of symmetry is found passing from the N-atom of the methyl-imidazole group through the central iron atom to the coordinated oxygen atom[18], and this suggests that the oxygen molecule is rotating within the pockets of the molecule (Fig. 3).

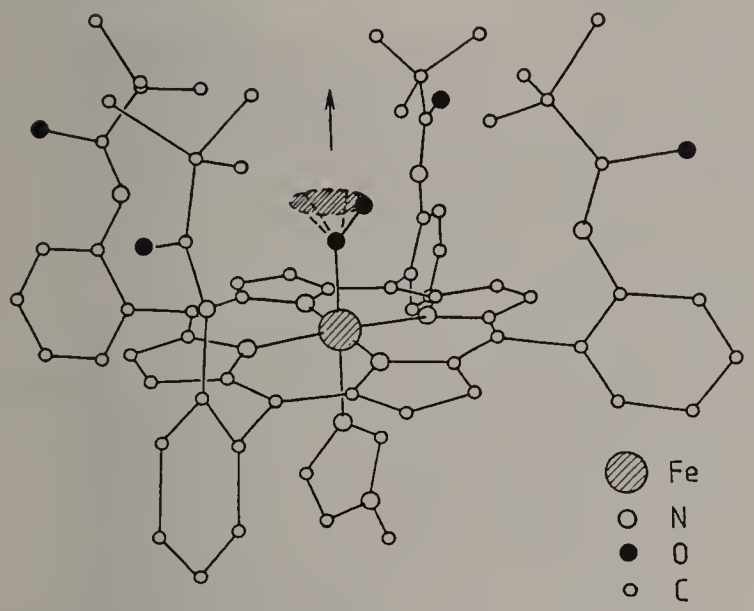


Fig. 3. Illustration of the rotations of the oxygen molecule in (dioxygen) (*N*-methylimidazole) [5,10,15,20-tetrakis(2-pivalamidophenyl)-porphyrinate] iron(II).

The well-developing system organization provides for the mutual influences between the four haem-groups. This state of affairs has been formulated by Perutz[16]: "Oxygen-free molecules are reluctant to take up the first oxygen molecule, but their appetite for oxygen grows with the eating. Conversely, the loss of oxygen by some of the haems lowers the oxygen affinity of the remainder. The distribution of oxygen among the haemoglobin molecules follows the biblical parable of the rich and the poor: 'For unto everyone that hath shall be given and he shall have abundance; but from him that hath not shall be taken even that which he hath' ".

It is further important to note that for every four molecules of oxygen taken up, two protons are released from terminal positions of the protein chains, and that for every four molecules of oxygen released at the tissues two protons are set free. Thus, the haemoglobin–oxygen interactions regulate the pH conditions within the erythrocyte cell, so as to dissolve carbon dioxide at the tissues and to release it at the lungs:

at the lungs:

$$\text{haemoglobin} + O_2 \rightarrow \text{oxyhaemoglobin} + 2H^+$$
$$2H^+ + 2HCO_3^- \rightarrow 2CO_2 + 2H_2O$$

at the tissues:

$$\text{oxyhaemoglobin} + 2H^+ \rightarrow \text{haemoglobin} + O_2$$
$$2CO_2 + 2H_2O \rightarrow 2H^+ + 2HCO_3^-$$

The latter reaction (dissolution of CO_2) is catalysed by carbonic anhydrase, an enzyme which is present in the red blood cells.

Thus, the interactions between haemoglobin and oxygen seem to lead not only to conformational changes which maintain the integral configuration and operation of haemoglobin but also to changes in the erythrocyte required for the transport of CO_2 back to the lungs.

It seems therefore that the iron-containing centres of the haem-groups have a prime position. For example, they serve as the highest hierarchic levels, to which the outer regions are immediately subordinated. The enormous amount of knowledge that is available concerning haemoglobin might be suitable for exploring further details of its system organization.

Research on system organizations should lead to new insights on the behaviour of enzymes and on the organization of cells within living systems. Knowledge on system organizations of solid, liquid or gaseous systems may lead to a new understanding of properties of material systems[2,19] and hence to new advances in all branches of molecular science and material science.

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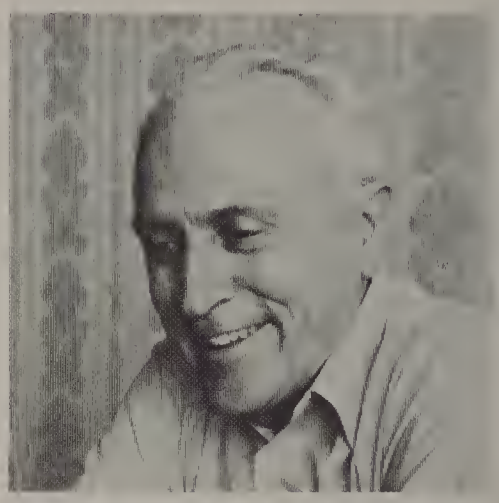
The Sofia Congress

The 31st International Congress of Pure and Applied Chemistry was held at the National Palace of Culture, Sofia, Bulgaria, from 13 to 18 July 1987. The scientific programme consisted of daily plenary lectures followed by nine parallel sections and poster sessions covering all branches of pure and applied chemistry.

The Congress was formally opened at the National Palace of Culture on Monday 13 July by Academician Zheliazkov, Vice-President of the Bulgarian Academy of Sciences which organized the Congress. Todor Zhivkov, President of the State Council of the People's Republic of Bulgaria then welcomed participants. He emphasized that science is a leading productive force.

Following Zhivkov's address, IUPAC President "Ram" Rao presented the greetings of the Union. Rao pointed out that IUPAC is the oldest of the scientific unions. It has not only specialized Divisions and Commissions but also Committees on Chemistry Applied to World Needs (CHEMRAWN) and Chemical Education (CTC) for example. CHEMRAWN VI in Tokyo, which focused on new materials, was very successful. IUPAC is therefore not only concerned with academic topics but also applications.



Academician Zheliazkov, Chairman of the Organizing Committee.

The President said that chemistry continued to be the most important science and it was fundamental to all other sciences. Chemistry is needed to solve many of the problems of today. He informed participants that IUPAC is the only international body representing chemistry and chemists at an

Entrance to National Palace of Culture during the Congress.

Fountains in front of National Palace of Culture.

View of Sofia and fountains from top of National Palace of Culture.

Four of the plenary lecturers at the Congress. Left: Prof. D. Behrens (FRG); bottom: Prof. M. Oki (Japan); right: Acad. S. G. Christov (Bulgaria); top: Prof. N. A. Platé (USSR).

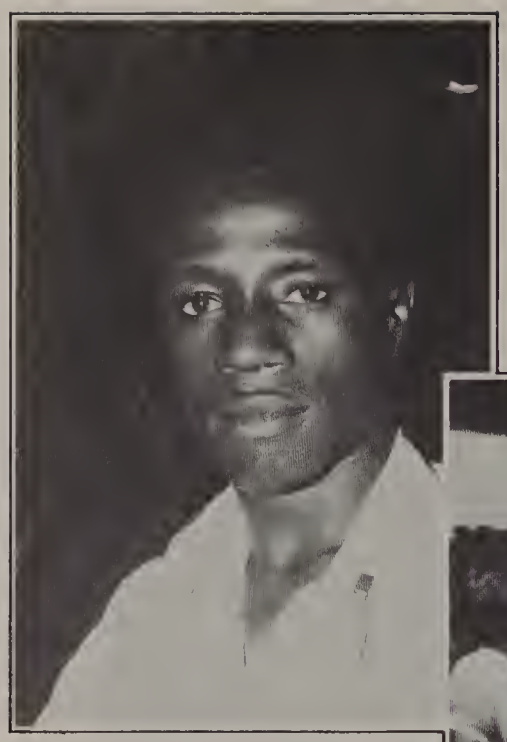
international level. He was proud to be a chemist and proud that IUPAC was holding its 31st Congress in Sofia. The word Sofia means "wisdom" and he was confident that the Congress would bring forth an abundance of chemical wisdom.

Approximately 1700 participants were registered for the Congress. These included 580 from abroad and 1120 from Bulgaria. In all, 44 countries were represented at the Congress. The 6th International Symposium on Heterogeneous Catalysis, also organized by the Bulgarian Academy of Sciences, was held in the National Palace of Culture at the same time as the Congress.

The following plenary lectures were presented at the Congress:

- Adventures in solid state chemistry (C. N. R. Rao, India)
- Liquid crystalline polymers — a breakthrough to the new world of materials and knowledge (N. A. Platé, USSR).
- Porphyrin sensitizers in tumour photo-therapy (R. Bonnett, UK).
- High pressure solid state chemistry (P. Hagenmuller, France).
- Cyclopentanoids via thermolysis (A. Dreiding, Switzerland).
- Some aspects of the theory of chemical reactivity (S. G. Christov, Bulgaria).
- Hydrogen technology perspectives in research, development and industrial use (D. Behrens, FRG).
- Electrodeposition of composite structures (A. Despic, Yugoslavia).
- Chemistry for decision making (M. Oki, Japan).
- Phase transition ceramics and its energy conversion applications (Y. L. Wang, China).

Affiliates at the Sofia Congress



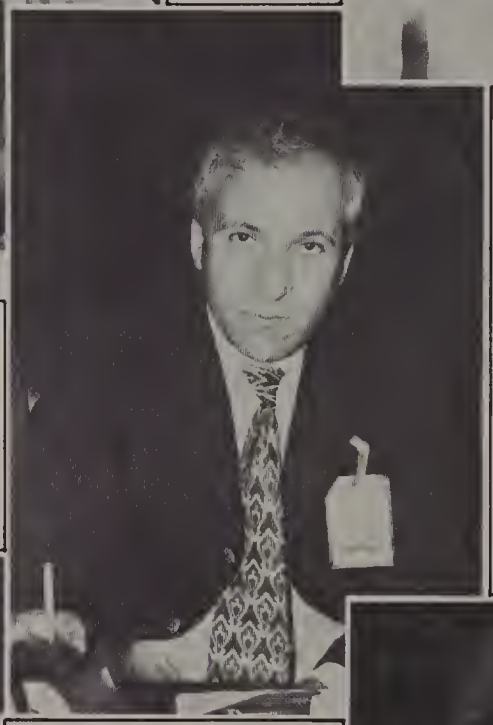
Sese Benemu who registered as the first Affiliate from Guinea when he attended the Congress. Benemu is doing research at the Food Technology Institute, Plovdiv, Bulgaria.

Hans Schoemaker, Affiliate from the Netherlands who leads the Bio-organic Chemistry section, DSM Research, Geleen.

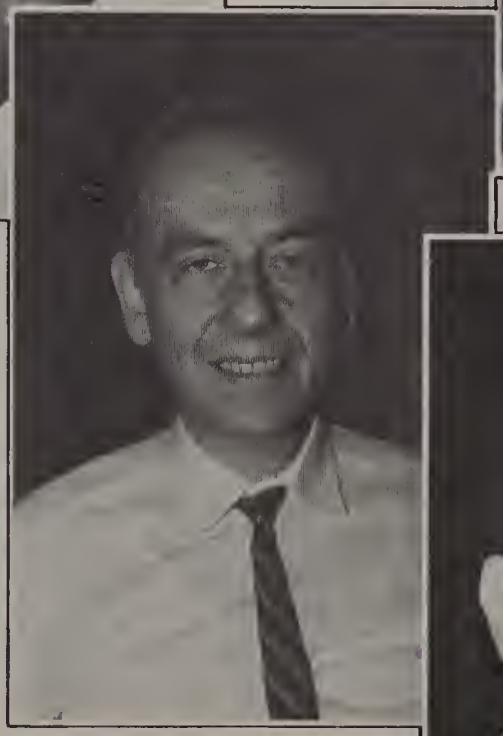
Kathryn Bullock, USA Affiliate, who is Manager of Electrochemical Research, Johnson Controls, Milwaukee and a member of the Commission on Solubility Data Subcommittee on Solid Solubilities.

Peter Towse, UK Affiliate and Editor of the *International Newsletter on Chemical Education.*

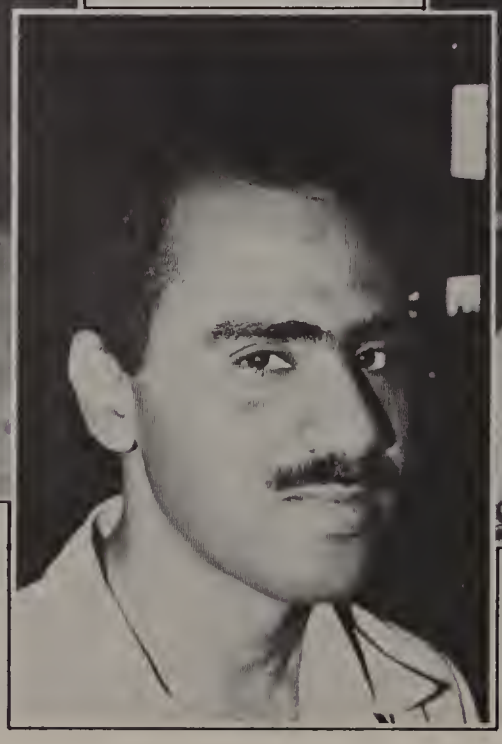
Waheed Badawy, an Affiliate from the Arab Republic of Egypt and Professor at Cairo University who is currently at the Free University of Berlin.

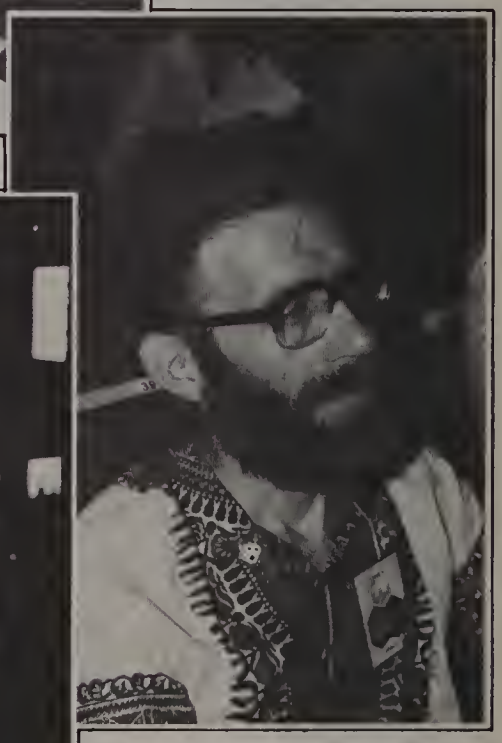


Dabbabi Mongi, who is the National Affiliate Membership Secretary in Tunisia.



Simeon Angelov, one of 15 Bulgarian Affiliates. He is Senior Research Fellow at the Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences, Sofia and a Secretary of the Congress Organizing Committee.





Ali El-Shekeil from Sanaá University who is the National Affiliate Membership Secretary for the Yemen Arab Republic.

The invited lectures and posters were grouped into nine separate topics:

1. Analytical chemistry
2. Education
3. Chemical engineering
4. Industrial chemistry
5. Inorganic chemistry
6. Organic chemistry
7. Physical chemistry and electrochemistry
8. Polymers
9. Clinical chemistry

The poster presentations were published in three volumes and the invited lectures in nine volumes. The following is a selection of extracts from the published invited lectures.

Invited lectures

Submicron particulates in fresh water

River, lake and pond waters generally contain small quantities of various kinds of particles and solutes. As shown in the Table they may be classified by sizes into three groups, that is, suspended particles, submicron (colloidal) particles and subnanometre species, although the boundaries are somewhat arbitrary and also ambiguous owing to the irregular, non-spherical shapes of the particles.

In addition to conventional water analysis, physicochemical characterization of these particles offers information useful in the fields of geochemistry, biological science, environmental science and water treatment. For example, toxic heavy metals may exist in fresh water not only as subnanometre species such as hydrated cations but also as species sorbed on suspended and submicron particles and show different geochemical behaviour and biological effects.

In recent years, much work has been done on trace element speciation, that is, determination of individual concentrations of various physicochemical forms of a trace element.

Our knowledge about submicron particles in fresh water, however, is still poor because of limited analytical tools and experimental difficulties.

The *Rilska reka* mountain stream near Rila, Bulgaria. Our knowledge of submicron particles in fresh water is poor because of limited analytical tools and experimental difficulties.

This paper described several experimental techniques and results recently obtained in Mizuike's laboratory for the morphology and chemical composition of submicron particles in fresh water. Here separation and concentration techniques play an important role, because the concentrations of the submicron particles are very low and most determination techniques lack selectivity in speciation studies.

From a paper on "Characterization of submicron particulates in fresh water" by Atsushi Mizuike, Nagoya University, Japan.

Classification	Example	Approximate size
Suspended particles	clay, soil, micro-organisms	> 1 μm
Submicron particles	aluminosilicates, SiO_2, Fe_2O_3, humic acid, humic acid–Fe_2O_3, micro-organisms	1 μm–1 nm
Subnanometre species	$Cu(H_2O)_6^{2+}$, $CuOH^+$, $Cu(OH)_2$	< 1 nm

Table. Particles and solutes in fresh water.

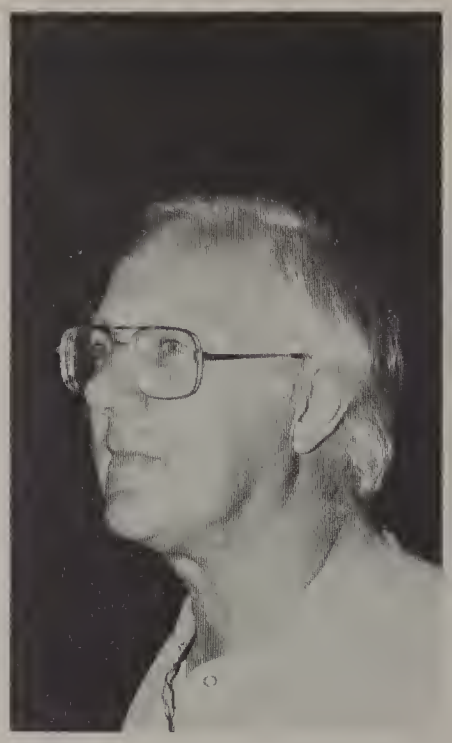
How to improve chemical education in schools

Much of the effort to improve chemical education in schools over the last 25 years has been based on good intentions and analogies rather than on a sound basis of research. This is not to identify a particular weakness in chemical education, for education of all sorts proceeds (and will continue to proceed) very largely on the basis of traditional procedures or as a result of popular slogans that capture the support of influential decision makers in Government or in the school system itself. Examples of such slogans that have had a major influence in science education are "Discovery learning", "Activity-based science education", "Conceptual approaches to science education", "Concrete-formal stages of learning", "Science — a Process Approach" and "Science, Society and Technology — an approach to science education".

Nor do I wish to suggest that these slogans are themselves without any basis in research. The research that has been done to enthuse their proponents has, however, usually been carried out in far more restricted settings, both educationally and socially, than the ones to which they are now being urged as panaceas. Thus, in the 1950s there was solid psychological research that pointed to learning benefits in teaching approaches that were described as ones which allowed and encouraged learners to "discover" intended learnings for themselves. Again, various psychological studies on memory and learning concepts were well known before the big science curriculum projects began to emphasize concepts in the late 1950s and 1960s. These psychological studies involved experimentally appropriate content and carefully controlled conditions that were orders of magnitude away from the complexity of a subject like chemistry or the situations that confront the world's chemistry teachers in the vast variety of schools where they have to teach students.

Since 1970 in a number of centres there has, nevertheless, been a steadily increasing amount of good research into the teaching and learning of chemistry itself. This paper sets out to describe three such studies that have a very direct bearing on how chemistry can be taught. In each case there have already been real school chemistry situations where improvements have occurred.

The first report is of a very major study in Thailand — a Third World country that has a great deal to teach more developed countries about not only the teaching and learning of chemistry, but also teaching science in schools more generally. The second study was carried out at Monash by a researcher from Singapore but involves the teaching and learning of problem solving in electrochemistry. Finally, the third study by an Australian



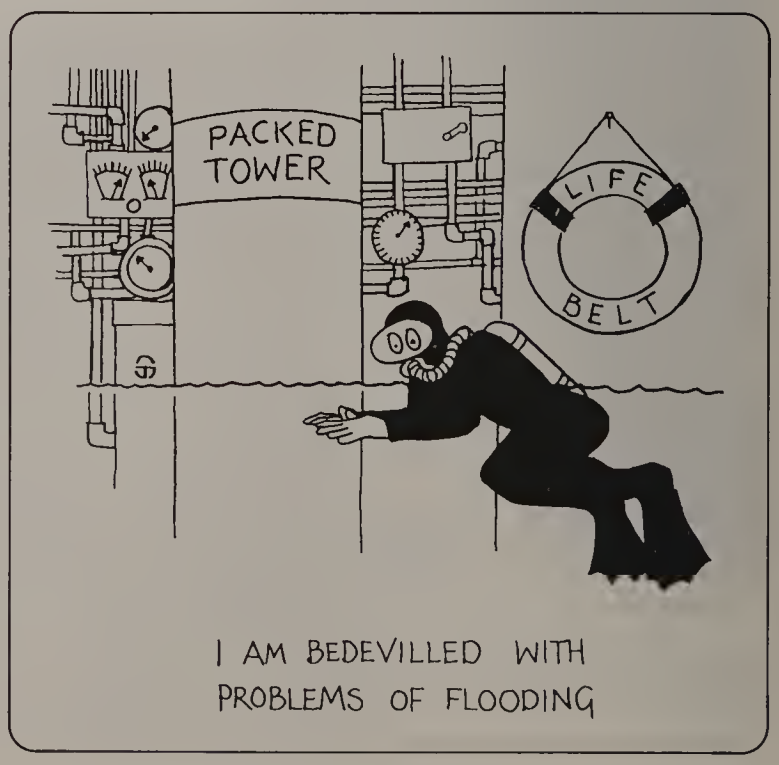
Peter Fensham: "Education of all sorts proceeds very largely on the basis of traditional procedures or as a result of popular slogans that capture the support of influential decision makers in Government or in the school system itself."

reports the effect of applying the findings from the recent research on alternative frameworks (or children's science) to his teaching of stoichiometry.

From a paper on "Improving chemical education in schools: three examples of how research helps" by Peter Fensham, Monash University, Australia.

I hate packed towers

I've always hated packed towers. I hated them when I was a student, I've hated to teach about them, and I've hated them when I did consulting. I hated them because they looked so simple, and yet are so hard to design. The simplicity comes from the idea of mass transfer. Usually, there's a single limiting resistance for mass transfer, and the mass transfer coefficients are calculated in a relatively straightforward fashion. My difficulties begin when I try to implement the design. I am bedevilled by



problems of loading or flooding, or of unexpected resistances. I find that these problems are especially frustrating for liquid–liquid extractions.

As a result, I've always wanted to find a substitute for packed towers. I now have one in hollow fibres. These hollow fibres are installed in modules which look like a small shell-tube heat exchanger. One of the fluids flows down the inside of the fibres, that is, in their lumen; the second fluid bathes the outside of the fibres. Thus the hollow fibre modules are a way of contacting two fluids countercurrently or cocurrently in a way roughly similar to packed towers.

Compared to packed towers, hollow fibres have three potential advantages and one significant disadvantage. First, they offer an extraordinarily high surface area per volume, up to 50 times that obtained in packed towers. Secondly, they can operate at liquid velocities which would produce flooding in the towers. Thirdly, they retain the large surface area even at very small flow rates, and hence are not susceptible to compromised loading. The disadvantage is that the membrane may offer a significant mass transfer resistance, which compromises the three advantages.

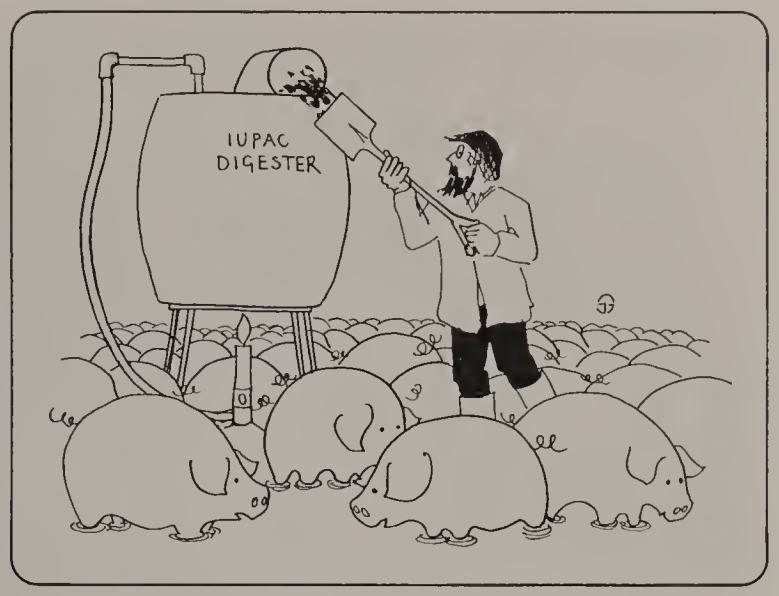
From a paper on "Hollow fibres as substitutes for packed towers" by E. L. Cussler, University of Minnesota, USA.

What to do with liquid pig manure

At present, chemical engineering can contribute substantially to the solution of problems which, although not related directly to process industries, are tightly linked to global issues such as energy conservation, environment protection and food production. This paper describes the application of the chemical engineering approach to the solution of one of the major problems of intensive agriculture in Czechoslovakia — liquid manure.

The liquid manure originates in litterless pigsheds. Its amount grows steadily because of: the limited availability of straw from the new highly productive varieties of wheat; the necessity to keep, during the mechanized harvest, the height of the cutter bar above ground in proportion to the presence of stones on the ground (due to deep ploughing); and finally the exploitation of straw for feeding purposes.

The biggest quantity of liquid manure is produced in pig and cattle breeding and/or in the breeding of hens for laying eggs. The problems of processing or liquefying of manure represent the limiting factor in expansion of large-capacity breeding concerns. Investigation of patents has demonstrated that this technology has not yet been successfully solved in a comprehensive way on a world scale. To a considerable extent it is a problem that is specific to socialist large-scale agricultural production.



There are for example, 300 farms at present in Czechoslovakia which shelter from 5000 to 30 000 pigs each. The problem with hens and cattle is of a similar scale. Each pig produces about 3 tons of liquid manure per year. The liquid manure is the source of chemical and bacteriological pollution of the human environment with a serious ecological impact. This negative factor is in existing technologies compensated for only to a very limited extent by the positive impact of liquid manure used for manuring purposes. To illustrate the proposed technology it is useful to briefly describe existing methods of the liquidation of manure.

The first, and until now, the most usual method is the transport of liquid manure to the field. In such a way one exploits on the one hand the manuring properties of liquid manure to increase the soil fertility and on the other hand the sorptive properties of soil for its liquidation.

"Each pig produces about 3 tons of liquid manure per year."

The second method represents the aerobic and biological purification. Here the solid material useful for composting is usually mechanically separated from liquid manure and the liquid phase, that is, waste water is conducted to the aerobic and biological cleaner where the degradation of an important part of the organic and nitrogenous pollution takes place.

The third method is the most perfect technological solution. It combines anaerobic digestion and aerobic purification. In the anaerobic digestion in the fermenter at a temperature of 35–40°C anaerobic bacteria produce biogas, that is a mixture of methane and carbon dioxide. But at the same time the level of degradable carbon substances in the processed liquid manure drops so that its ratio to the level of nitrogenous substances falls below

Poster viewing at the Congress.

the critical value necessary for the activity of bacteria in the aerobic purification.

This problem must be solved either by addition of a degradable carbon substance (e.g. methanol) or by reducing the content of nitrogenous substances by deammonization. The second possibility is preferable. Waste water from the methane fermentation, mechanical separation of the solid compound and deammonization can be aerobically purified with substantially smaller investment and operational expenses than raw liquid manure after only the mechanical separation.

The advantage of the above-mentioned method of processing liquid manure is that the partial decomposition of organic substances provides a valuable source of energy — biogas — and in the process of deammonization, ammonia fertilizer is obtained. The main drawback is the considerable investment expense for anaerobic digestion.

From a paper on "Technology of complex processing of liquid manure from the large-scale breeding of domestic animals" by J. Čermák and J. Červenka, Institute of Chemical Process Fundamentals, Czechoslovak Academy of Sciences, Prague, Czechoslovakia.

The spruce budworm

The spruce budworm, *Choristoneura fumiferana* (Clem.), is the principal defoliator of spruce–fir forests in eastern North America and as such, poses serious problems for the productive management of these forests. From historical records, annual ring analysis of old trees, and more recently, detailed ecological observations, it is evident that at least during the last two centuries, populations of the insect in eastern Canada have oscillated. Major outbreaks followed by dramatic declines have recurred in 30–40-year cycles.

An understanding of the factors which cause the decline of an epidemic spruce budworm population is clearly of central importance to both the ecologist and the forest manager. For this reason the study of natural agents contributing to budworm mortality continues to be pursued actively in several laboratories.

The suggestion that fungi associated with host tree foliage could produce metabolites toxic to the spruce budworm is in consonance with an increasing body of evidence indicating that plant–fungal associations can provide some protection to the plant against phytophagous insects and other herbivores. It was proposed that both epiphytic and endophytic fungi could play a role in the interaction between the spruce budworm and its hosts.

In 1985, Miller and co-workers disclosed the results of a survey in New Brunswick of fungi from foliage of balsam fir, sampled both from trees infested by spruce budworm and from budworm-free trees. They observed that the presence of spruce budworm altered the mycoflora on the foliage, more than doubling the diversity of fungi isolated. While most of the isolates were well-known colonizers of conifer needle surfaces, about 6% of the isolates from the budworm-infested trees were unusual needle phylloplane fungi, not isolated from the insect-free foliage. Significantly, some of the fungi in this group are toxigenic, pathogenic or both. Several of these micro-organisms were selected for further study, and our findings to date concerning one of them, *Fusarium avenaceum*, are described in this report.

The fungus *F. avenaceum* is known to be pathogenic to a range of plants, including conifers, though it is not considered an important disease organism in the spruce–fir forests of eastern North

America. The fungus occurs mainly in the soil as a saprophyte, but it can infect the roots of susceptible plants, and in the study described by Miller, it was isolated from foliage. It has also been reported to colonize an insect pest of grain, and has been observed to grow saprophytically on spruce budworm larvae.

From a paper on "Toxicity of fungi associated with conifer foliage to spruce budworm, Choristoneura fumiferana *(Clem.) (Lepidoptera: Tortricidae)" by George M. Strunz and Douglas B. Strongman, Canadian Forestry Service — Maritimes, New Brunswick, Canada.*

Essential oils in China

Essential oil is an important source of natural and synthetic fragrance and flavour as well as of medicinal products. China has been well known for her production and export of essential oils from peppermint, *litsea cubeba*, cedarwood, *eucalyptus citrata*, citronella, eucalyptus, sassafras, star anise, cassia and spearmint, in addition to the 50 000 tons' annual production of turpentine oil.

Other essential oils now in production include those from citrus, wintergreen, patchouli, geranium, vetiver, lavender, ginger, lemon and clove. Some 20 popular flower concretes (or absolutes) such as jasmine, michelia, osmanthus, aglaia and several rose species are also available on the market.

These essential oils and floral concretes are produced in some 20 aromatic plants scattered mainly in south and east China, such as Guangzhou, Hangzhou, Fuzhou, Zhangzhou, Nantong, Guiling and Nanjing, but some important varieties of these oils do come from the western part of China, for example, certain rose oils from Xinjiang, Ganshu and Sichuan, lavender oil from Xinjiang, geranium oil from Yunnan and Sichuan, oak moth oil from Yunnan, spearmint oil from Xinjiang and Sichuan and citrus oil from Sichuan.

The isolation and partial synthesis of useful essential oil constituents are carried out mainly in Shanghai, Nantong, Tianjing, Guangzhou, Huangyen, Fuzhou, Jianyang, Zhangzhou and Puchen. However, the total synthesis of essential oil isolates and derivatives are more or less concentrated in Shanghai, with Tianjing, Shenyang, Songhuajiang in the north and Huangyen in the south providing part of the ester compounds.

The major isolates which have been exported are menthol, geraniol, citral, cedrol, linaloöl and sassafrol, while camphor, α-terpineol and esters, vanillin, phenyl ethyl alcohol, benzyl alcohol and esters, borneol, the butyrates, heliotropin, diphenyl ether, the ionones and coumarin are among the high-tonnage synthetic products. The total export of natural aromas amounts to 3–4000 tons year^{-1}, distributed in 20–30 varieties, while around 30 synthetic essential oil constituents are exported with a total tonnage of around 5000 tons year^{-1}. On the other hand, China also imports about 25 kinds of natural aromas which amount to some 300 tons year^{-1}, and around 100 varieties of synthetic aromas with a total tonnage of more than 30 tons year^{-1}.

The synthetic aroma industry starting from essential oils includes the citronella oil series, the *litsea cubeba* oil series, the turpentine oil series, the cedarwood oil series and the sassafras oil series. These afford most of our present synthetic aromas of terpenic type.

From a paper on "Some recent progress in the chemistry of essential oils in China" by Liu Zhujin, Shanghai Institute of Organic Chemistry, Academia Sinica, China.

Environmental protection — a challenge for the chemical industry

For more than a century, people looked on the chemical industry as the provider of the blessings of technology. Synthetic dyes replaced natural ones, and could be widely used in the fashion industry; plastics and fibres opened up extensive

Each successive generation believed in the apparently limitless power of air and water to accept all kinds of pollutants.

The Congress social programme and excursions included trips to Plovdiv (left) and Rila Monastery (right). Plovdiv is an old city dating from Roman times. Rila Monastery is the most impressive architectural and historical monument in Bulgaria. It was founded in the 10th century — about 200 years after the adoption of the Christian religion by the Bulgarians.

fields of activity. And an ever-increasing range of new products made life easier to live.

It was, of course, impossible to produce and apply these new substances without side effects — but people accepted the disadvantages because they were convinced that the advantages were more important.

For many years the regenerating power of nature was overestimated. Each successive generation believed in the apparently limitless power of air and water to accept all kinds of pollutants. Not only that, but people were not fully aware of the harmful effects that these may have on man.

It was only about 30 years ago, as production increased, that the repercussions for the environment became more apparent. The oxygen content of many surface waters declined sharply, while the atmosphere became increasingly laden with pollutants and dust.

This trend was perceived in industry and by the authorities, and the first steps were taken to counter it long before environmental protection became a political slogan.

The public at large was slower to develop this new awareness, which only became apparent as a result of such spectacular calamities as the Seveso disaster of 1976.

People became more critical not only of the chemical industry but of technology in general; today there is a much greater tendency than in the past to contrast the advantages of industrial production with its actual and alleged disadvantages.

Unfortunately, the result is frequently an overreaction. The disadvantages of chemical production are exaggerated or even concocted. No notice is taken of the advances long since made in the field of environmental protection.

This attitude among the public is, naturally, reinforced by incidents such as the Sandoz fire accident, which triggered general increase in awareness that went far beyond the scope of the actual event. The fact remains that, even after Sandoz, the quality of the water in the Rhine today is much better than it was 10 years ago. Oxygen levels in the Rhine have returned to the normal figure of 10 mg l^{-1}. As a result, the damage done to the river's ecosystem can be made good relatively quickly.

This accident, however, will result in more stringent environmental legislation in many countries. Irrespective of this, the chemical industry will continue making great efforts to achieve further improvements in environmental protection, above and beyond the heavy capital spending programmes of the past 20 years. This is no hollow promise: witness the fact that, even before the Basel fire, the German chemical industry had drawn up guidelines for environmental protection and safety which are binding on the associated companies and their employees.

The key sentence in these guidelines reads: "The chemical industry takes steps to protect the environment on its own initiative and responsibility."

It follows that environmental protection has become a part of corporate policy for chemical companies.

From a paper on "Production-integrated environmental protection — a challenge for the chemical industry" by G. Lipphardt, Hoechst AG, Frankfurt, FRG.

New agrochemicals

Chemical plant protection has a long-standing history. Accurate data on the nature of pests and on plants to be protected can be traced back 200 years, to the fungicidal use of copper sulfate ($CuSO_4$) or the insecticidal use of nicotine from tobacco extracts.

But it is only since the second world war, when research on chemical plant protection started on a broad base that industries were attracted by emerging vast opportunities which developed parallel to modern agricultural technologies. Within a few years we experienced many innovations from all parties who invested in research.

The success-rate, however, started to decline in the seventies. Since then we observe a continuous increase of research effort which is not proportionally balanced by the development of new plant protection agents. To find and develop new plant protection agents is thus becoming more and more investment-intensive. Whereas 10–20 years ago we could expect to find and develop one product with less than 10 000 compounds screened, today it is unanimously accepted that that number has substantially increased.

Once found, the products have a finite product life which can be prematurely ended by development of pest resistance, through substitution by products that do a better job or by decertification for toxicological or other reasons. To maintain productivity and efficiency of plant protection research thus calls for a major effort.

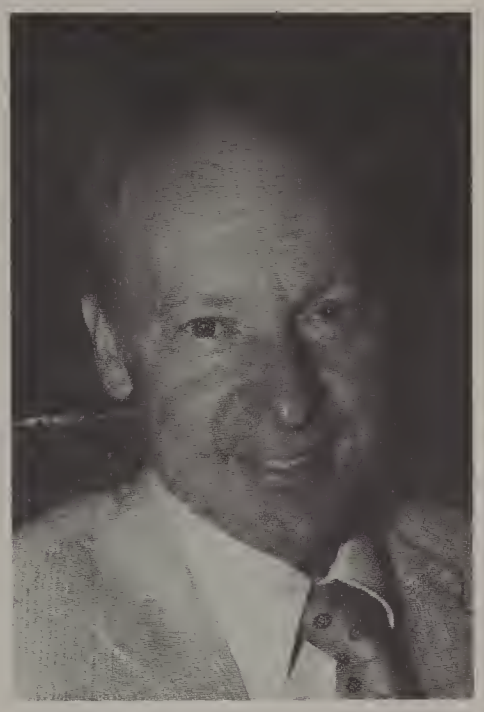
Chemodynamic studies, to determine dosage transfer, are one means to improve the rational development of plant protection agents. Examples of the chemodynamic behaviour of droplet deposits (evaporation, photolysis, hydrolysis, wash-off and penetration) were given in this paper and the effects that structural changes of chemicals have on these processes were demonstrated.

From a paper on "Synthesis and chemodynamic behaviour of new agrochemicals" by Kurt Gubler, Christian d'Hondt and Adrian Steinemann, CIBA–GEIGY Ltd, Basel, Switzerland.

Ultra pure rare earth metals and compounds

In order to prepare ultra pure rare earth materials one must use the highest purity chemicals available and follow exacting handling procedures from the beginning to the final product. Once an impurity is introduced or is not entirely removed in a chemical processing step, it is extremely difficult to remove it at a later step. Our operating philosophy is based on the old proverb "28 grams (an ounce) of prevention is worth 0.454 kilogram (a pound) of cure".

The impurities in rare earth materials can be grouped into three categories: 1. lanthanide impurities, 2. magnetic transition metal impurities, and 3. interstitial impurities. The absence or presence of lanthanide impurities is extremely important both in basic research and applications involving the optical behaviour of the rare earth element compounds.



Converting proverbs to SI. Prof. K. A. Gschneidner, Jr: "28 grams of prevention is worth 0.454 kilogram of cure".

Most of the critical lanthanide impurities can be controlled by commercial producers such that only 1 ppm atomic or less is present. This level of impurity is satisfactory for most phosphor, laser, camera lens, etc. applications in use today. But with the interest in the use of rare earth fluorides in fluoride glass optical fibres, there is some discussion of an ultimate impurity level of the lanthanides in lanthanum or yttrium fluoride of the order of one ppb, or about three orders of magnitude lower than what we think we are capable of producing.

One of the problems is that new analytical techniques need to be developed if science and technology are going to move in this direction, and I think they will. Basic research on the electronic and magnetic behaviours of the rare earth metals and compounds also require impurity levels in the ppm atomic range, especially if low temperature, < 20 K, studies are being made. If a given lanthanide material orders magnetically above 1 K, more than likely the presence of other magnetic lanthanides, even up to 100 ppm atomic, will have little if any effect on the magnetic properties. For many other research areas and most applications involving the individual rare earth elements, lanthanide impurities in the 10 to 100 ppm atomic can be tolerated and generally have no measurable effect.

Similar concerns as noted above for the lanthanide impurities also apply to the magnetic transition metal impurities (i.e. Cr, Mn, Fe, C and Ni).

Since most of the ions of these elements strongly absorb in the various electromagnetic regions, they cannot be tolerated when the rare earths are used in optical applications.

With regard to low-temperature properties, the magnetic transition metal impurities are of a more serious concern than the lanthanides, because smaller concentrations (approximately one-tenth of those of the lanthanide impurities) will give rise to the same kind of anomalies as a magnetic lanthanide impurity. But for magnetically ordered lanthanide materials, 100 ppm atomic of the transition metal generally can be tolerated with no notable influence on the magnetic behaviour.

Interstitial impurities normally will not have much effect on the behaviour of most rare earth materials which are used in various applications. But they can have profound effects on the low-temperature electrical and magnetic properties (especially non-magnetic materials).

Which impurity or group of impurities that need to be controlled will ultimately depend upon the intended use, whether it be an application or some research project. Thus one needs to be aware of this and design the preparation and/or purification processes accordingly.

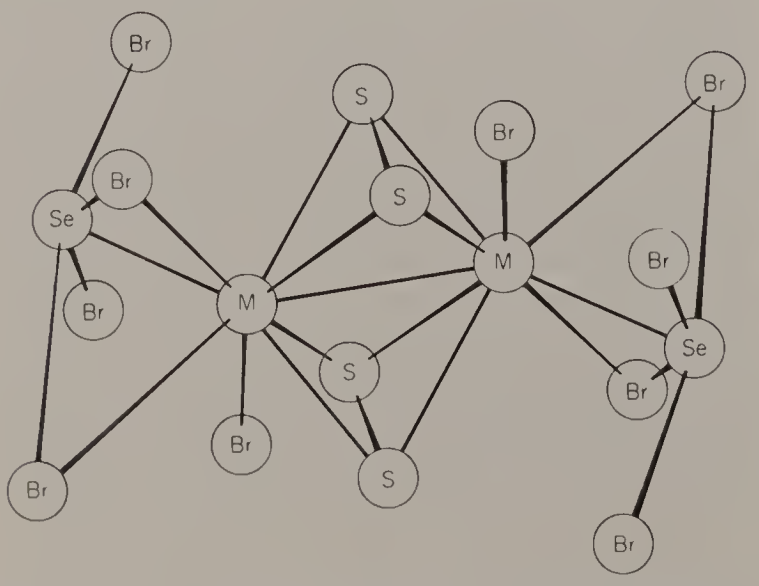
From a paper on "Ultra pure rare earth metals and compounds: their preparation, properties and effects of impurities" by K. A. Gschneidner, Jr, Iowa State University, USA.

Molybdenum(V) and tungsten(V) chalcohalides

A number of chalcohalide complexes of molybdenum and tungsten having an unusual composition: $MS_2X_3(SeX_2)$ (X = Cl, Br) have been synthesized. Their structure was studied by vibrational spectroscopy, ^{35}Cl and ^{79}Br NQR methods, by magnetic measurements and X-ray structure analysis for bromide compounds.

The molecules of the compounds are dimeric; the metal atoms (d^1) in them are bonded directly by an ordinary bond and bridging S_2 ligands, coordinated perpendicular to the metal–metal bond.

The coordination of SeX_2 (X = Cl, Br) ligands is unusual: the selenium atom, as donor, is bonded to the metal and, as acceptor, to two bridging halogen atoms.



Structure of $Mo_2(S_2)_2Br_6(SeBr_2)_2$ and $W_2(S_2)_2Br_6(SeBr_2)_2$

From a paper on "The structure of molybdenum(V) and tungsten(V) chalcohalides" by S. V. Volkov, W. L. Kolesnichenko and N. I. Timoshohenko, Institute of General and Inorganic Chemistry, Kiev, USSR.

Producing hydrogen and electricity from water and light

The production of hydrogen and electricity from water and sunlight has been studied using photoelectrochemical and photovoltaic devices. The rate of hydrogen evolution on p-type semiconductors can be increased significantly by etching the surface, and also by depositing small islets of electrocatalysts on the surface.

The photocorrosion of small band gap non-oxide semiconductor photoanodes can be prevented by depositing suitable conducting and transparent coatings on the electrode surface. Using electrocatalysed photocathodes and protected small band gap semiconductors as photoanodes, high efficiencies (~ 10%) for the photoelectrolysis of water can be achieved. Using photovoltaic electrolysers, conversion efficiencies of 4–8% have been achieved. The efficiency can be improved by making use of tandem solar cells.

Prof. J. O'M Bockris: "Photocorrosion of semiconductors under anodic photocurrents is one of the major problems of photoelectrochemistry. Progress has been made in the protection of non-oxide semiconductor photoanodes for use in photoelectrochemical cells (PEC's) for water electrolysis."

From a paper on "The production of hydrogen and electricity from water and light" by J. O'M. Bockris and R. C. Kainthla, Texas A&M University, USA.

Congress Organizing Committee

The Chairman of the Organizing Committee was Academician Zheliazkov. Other members of the Committee included: left: Prof. R. Vlahov (Secretary); bottom: Mrs M. Racheva (Technical Secretary); right: Dr L. Boyadzhiev (Co-chairman); top (from left to right): Dr E. Zhecheva (Inorganic Section Programme Secretary), Prof. O. Peshev (Programme Secretary), Dr E. Tsankova (Organic Section Programme Secretary)

Try not to quit

Until recently, structural elucidation of saponins has relied mainly on more or less selective chemical or enzymatic degradations. In some cases ^{13}C NMR spectroscopy and mass spectrometry have been used effectively, especially when series of related compounds were available. Due to the complexity of the spectra, ^{1}H NMR spectroscopy has been of little help, except when the number of sugars is limited. The purpose of this lecture was to show how modern ^{1}H NMR techniques may be used in the structural elucidation of these complex molecules.

Our interest in saponins originates in the large-scale production of alfalfa protein concentrates in our region, Champagne–Ardenne. These protein concentrates are well balanced in amino-acids and also contain vitamins and colouring matters. They find widespread use in poultry feeding. Their low cost, relative to soya proteins, is another reason for their success. However, the development of this product is limited by two drawbacks, which become apparent when too high a ration of these proteins is given to the poultry.

One is the loss of weight and the other is a diminished egg production. Even though alfalfa protein concentrates may be incorporated in up to 10% of the poultry feedstock without such effects and this saves money to the producers. The undesirable properties of the proteins have been attributed to the presence of saponins; there are also saponins in soya with no such side effects. As chemists, we considered it worthwhile, to examine these saponins and to try and find out why they have a detrimental effect on chickens.

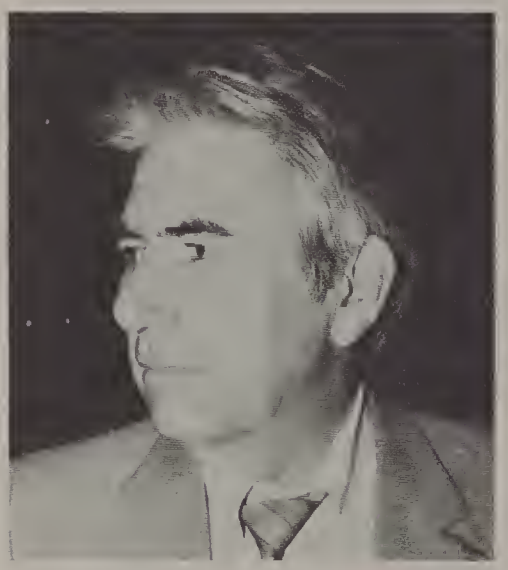
I will not dwell on the difficulties we encountered in the extraction and purification of the saponins. Even though there have been significant advances in the field, for example, the use of reverse phase HPLC and DCCC, I claim that there is no general recipe to make a complex mixture of saponins surrender. Let me quote W. C. Fields: "Try, try again and then quit" but try not to quit. We solved our problem by acetylation.

From a paper on "Structural elucidation of saponins using proton NMR experiments" by Georges Massiot, UA au CNRS, Reims Cedex, France.

Phosphorus polymers

The use of polymers in recent years especially in everyday life has increased considerably. The requirements for their fire resistance have also risen.

Phosphorus-containing active and inactive additives are well-known fire retardants and some of them are produced nowadays in considerable quantities. However, the practical use of new phosphorus-containing fire retardants is dependent on the availability of the phosphorus starting materials. The introduction of phosphorus in the polymers leads to improvement not only of their fire resistance but very often also of their adhesion, dyeability, water absorbance and aging resistance.



Prof. Gueorgui Borrisov: research on synthesizing new phosphorus-containing flame retardants.

With the view to broadening the number of the flame retardants and to improving their quality, our activity has been aimed at synthesizing new flame retardants on an industrial scale from tetrakis (hydroxymethyl)phosphonium chloride (THMPC), dialkyl phosphites (DAP) and hypophosphorus acid (HPA).

From a paper on "Phosphorus-containing monomers, oligomers and polymers" by G. Borissov, Central Laboratory for Polymers, Bulgarian Academy of Sciences, Sofia, Bulgaria.

Photodynamic therapy: a new approach to treating cancer

Photodynamic therapy (PDT) is a technique which offers a relatively new approach to cancer treatment. PDT of cancer should achieve selective tumour destruction as a consequence of both the preferential accumulation of photosensitizer and the accuracy of light delivery. Light from a laser source is used to activate the photosensitizer and generate cytotoxic species. Importantly, it is suggested that repetitive treatment with PDT does not cause further damage to normal tissues in the irradiation zone, which offers an advantage over other types of therapy.

Currently, the photosensitizer of choice is haematoporphyrin derivative (HpD) which is capable of localizing in a wide variety of human tumours. However, there are many disadvantages which make HpD far from ideal as a photosensitizing agent. It contains a large number of components and while some candidates have been identified as the active components, they are not yet chemically purified.

Furthermore the problems inherent in attempting to work with a complex mixture of substances, whose composition may vary from batch to batch, are compounded by the fact that HpD may aggregate to different extents in different environments with marked alterations in biological efficacy. An additional disadvantage is that HpD has a poor absorbance at light wavelengths longer than 600 nm, the optimal wavelength for good tissue penetration. Finally, patients receiving HpD often suffer from skin photosensitive reactions to daylight.

These limitations have stimulated the search for alternative photosensitizers for clinical use. Recently, a number of such candidate agents have been proposed as having the necessary characteristics to serve as photosensitizing agents, for example, phthalocyanines, a number of porphyrin derivatives, purpurin derivatives and kryptocyanines.

In our laboratory, we have been investigating the possibility of employing phthalocyanine dyes as photosensitizing agents for PDT of cancer. Using a simple *in vitro* test we screened 11 water-insoluble dyes and six water-soluble sulphonated derivatives for their ability to photosensitize tissue culture cells under red-light or room-light irradiation.

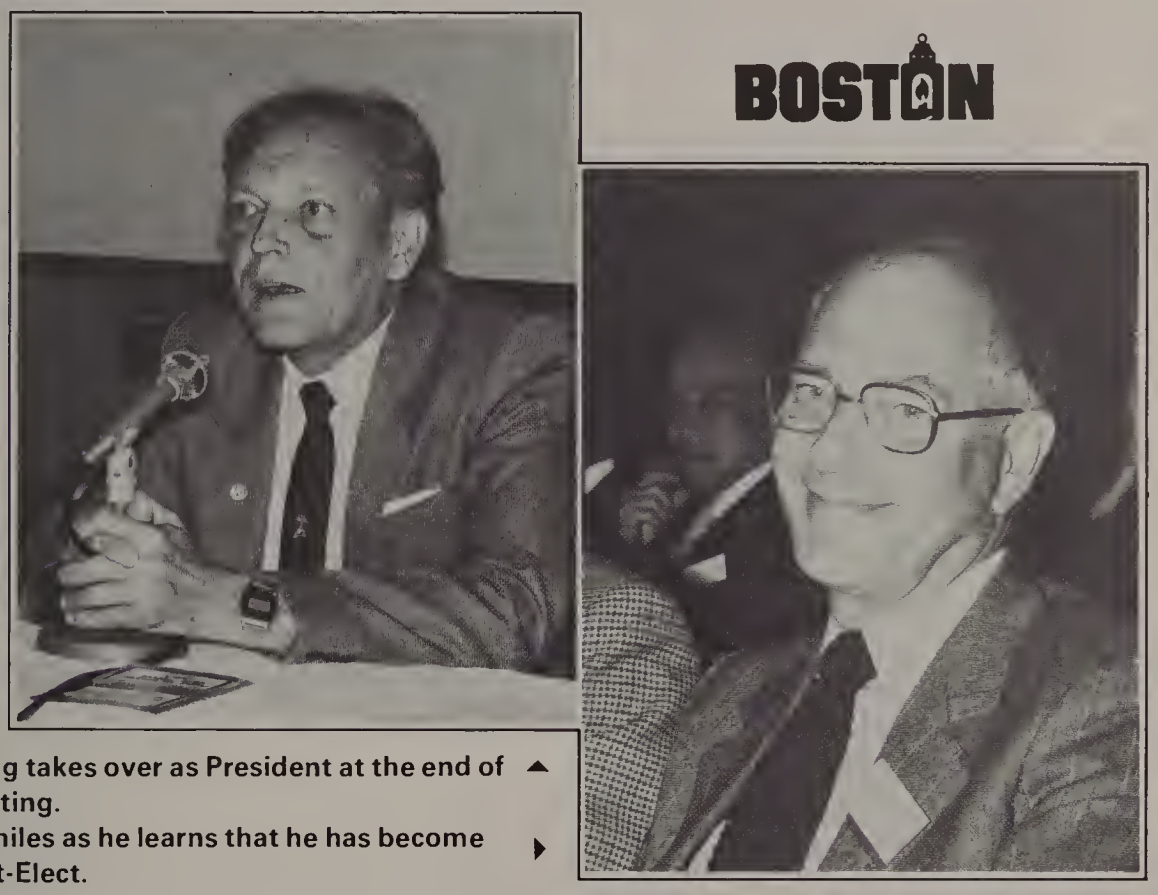
Three dyes, chloro aluminium sulphonated phthalocyanine (ClAlSPc), chloro aluminium phthalocyanine (ClAlPc) and dichloro tin phthalocyanine (Cl_2SnPc) were highly toxic to cells following red-light irradiation but no or little cytotoxic effects were observed after room-light exposure. These results raised the possibility that such dyes could reduce the adverse side effects of photosensitization while still allowing photokilling through red-light activation.

Further *in vitro* studies comparing one of those dyes, ClAlSPc, with HpD showed that ClAlSPc is inherently less toxic to cells but is more phototoxic after red-light exposure. In this study, we report the kinetics of ClAlSPc uptake and retention, as compared to normal adjacent skin and muscle tissues, by the murine colon carcinoma, Colo 26, implanted subcutaneously in syngeneic hosts, and describe the effects of laser treatment on tumour growth.

From a paper on "Uptake, retention and photodynamic effects of chloro aluminium sulphonated phthalocyanine by Colo 26 carcinoma growing subcutaneously in syngeneic mice" by W.-S. Chan, J. F. Marshall and I. R. Hart, Imperical Cancer Research Fund Laboratories, London, UK.

The Boston General Assembly

Approximately 700 chemists from 45 countries attended the 34th IUPAC General Assembly held in Boston, USA from 21 to 29 August 1987. The first week of the Assembly was largely taken up with Commission and Committee meetings. After these the Bureau met. The Assembly culminated in the 34th Council meeting on the final two days. During the Council meeting, Division Presidents and Chairmen of Standing Committees presented their reports. Elections of a new Vice-President and new Bureau Members also took place during the Council meeting.



Valentin Koptyug takes over as President at the end of the Council meeting.
Yves Jeannin smiles as he learns that he has become IUPAC President-Elect.

Prof. Valentin Koptyug takes over as President

Prof. Valentin Koptyug (USSR), who became Vice-President of IUPAC in 1985 at the Lyon General Assembly, took over as President at the end of the Council meeting. One of his first tasks as President was to chair a meeting of the Bureau which took place after the Council meeting. A pen-portrait of Koptyug was published on p. 114 of the May 1987 issue of *CI*.

Prof. Yves Jeannin (for pen-portrait see *CI*, p. 155, July 1987) was elected Vice-President. He will assume office at the end of the 35th Council Meeting in Lund, Sweden in 1989.

Prof. Tom West and Prof. Anders Bjorkman were reelected as Secretary General (1987–1991) and Treasurer, respectively, for the period (1988–1991). Their pen-portraits are on pp. 156–7 of the July 1987 issue of *CI*.

Bureau elections

The following were elected to the Bureau for the period 1987–1991:

- Prof. M. T. Beck (Hungary)
- Prof. J. Jortner (Israel)
- Prof. G. Modena (Italy)
- Prof. N. Sheppard (UK)
- Prof. H. A. Staab (FRG)

Pen-portraits of all these appeared in *CI*, pp. 157–161, July 1987.

In addition, Prof. A. J. Arvía was re-elected for another four-year period:

More on the Boston General Assembly in the next issue of *CI*.

Prof. A. J. Arvía (Argentina)

Prof. Alejandro Jorge Arvía was born in Argentina in January 1928. He was awarded his Doctorate in Chemistry in 1952 by the National University of La Plata. He was appointed Professor of General Chemistry at the University of Buenos Aires in 1958 but moved to the National University of La Plata in 1960 as Professor of Industrial Electrochemistry, later, in 1968, becoming Professor of Physical Chemistry.

At present Prof. Arvía is Professor of Physical Chemistry, Faculty of Exact Sciences, University of La Plata. He is also Researcher of the National Research Council of Argentina (CONICET) and Director of the Research Institute of Theoretical and Applied Physical Chemistry (INIFTA). He has served on many national and international committees, including being President of the Advisory Committee on Chemical Sciences of the Argentine National Council on Scientific and Technical Research.

He has more than 300 scientific publications in national and international journals and has made 11 contributions to books on electrochemistry and physical chemistry.

Prof. Arvía has been involved with IUPAC for many years. In 1980 he became Argentine National Representative on the Commission on Electrochemistry (I.3). He has just completed a four-year term on the Bureau.

State of the Union

Prof. C. N. R. Rao

What has IUPAC achieved over the last two years? How should the Union develop in the future? These are two of the questions considered by Prof. Ram Rao in his "State of the Union" address presented to Council at Boston. The following is the text of his address.

The Union has continued to contribute to the chemical profession in a significant way over the last two years. The various Divisions, Commissions and Committees have done commendable work. Some of the important reference works and resource books such as the *Red Book* are being constantly updated, and this has involved considerable work. I want to thank all those involved in these important tasks. The critical assessment of IUPAC projects carried out by Vice-President Koptyug has been most useful.

We have made definitive beginnings in certain new areas such as biotechnology, areas related to the environment and also chemical kinetics. We still have a long way to go in these and other areas before we are truly part of the revolution that chemical science is going through today.

I must specially mention the work of CHEMRAWN. The symbiotic relationship between the Union and CHEMRAWN has to be protected and promoted. We had a successful CHEMRAWN Conference in the Federal Republic of Germany dealing with medicine and health. The last CHEMRAWN Conference in Japan on "Advanced Technology Materials for Innovation in Communication, Transportation and Energy" was outstanding. Actually, this was a trend-setting conference dealing with an area of utmost importance to the world today. I only wish that more people had attended these conferences. With such excellent conferences, CHEMRAWN will become a great asset not only to chemists but to all professionals in science, engineering and technology. Even those involved in planning and development should get interested in

Joint COCI/CHEMRAWN meeting at Boston.

▲
Science Center, 590 Commonwealth Avenue, venue of the Council meeting and many other General Assembly meetings.

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Delegates at the Council meeting. ▶

Downtown Boston viewed from the Cambridge bank of the Charles River. ▶

the activities of CHEMRAWN. I am certain that CHEMRAWN will continue to contribute to IUPAC.

The important role of the Committee on Chemistry and Industry (COCI) cannot be overemphasized. The Committee has to work more effectively in the years to come and identify fully with the activities of the Union. We expect much from this Committee.

The Committee on Chemical Databases (CCDB) has started functioning and this may work out not only to be useful but even to bring in some income to the Union eventually.

Our publications have done very well and the new publishers have been able to generate more funds for the Union. We have published many valuable books and conference proceedings.

Restructuring

It appears as though the nature of chemical science itself has changed in a subtle but significant way in the last few years. IUPAC being the only international professional body relating to chemistry, not only has to be conscious of these changes but should also participate in the dynamics of growth of the profession. It is because of this that some members have suggested that we should give some thought to the possible restructuring of the Union.

One possible way of restructuring the Union would be to have an entirely new classification of programmes where we do not divide chemical science into its classical branches such as physical, organic, inorganic etc. Such a new classification

which takes into account the way chemistry grows and works for man, would indirectly encompass all the classical disciplines, but would probably be a major departure from the traditional. However, the spirit of such a suggestion should be kept in mind in whatever we do.

"Some members have suggested that we give some thought to the possible re-structuring of the Union."

Even though it is more convenient to keep the classical divisions of chemistry for working purposes, we have to, all the time, be sure that we take into account the emerging areas and the new changes in the profession.

Think-tanks

If we see what has happened in the last few months, the area of superconductors has come in a big way where all physical scientists and engineers are trying to contribute in some manner. Obviously, chemists have had much to contribute. Being personally involved in this area, I can tell you that this has been the most exciting period of my own research career. I cannot think of another year which has been professionally more enjoyable than 1987, because of the exciting opportunities the area of superconductors has provided.

Any such significant change in the scientific scenario would obviously affect our lives, the way we work in the laboratory as well as the kind of research problems that we may take up in the future. The question, however, remains as to the manner in which IUPAC can participate in, or contribute to, such changes occurring in chemical science. It is in this context that I believe that each of our Divisions, and possibly the Bureau as well, must have think-tanks with small groups of people who would be on the look-out for new ideas. Such forward planning would help the Union to get recognized as the leader of the chemical profession and as a path finder. If we do not take up this task, I am afraid that we will be known only for certain types of activities which may not always excite the imagination of professional chemists, particularly of the younger generation.

It is because of this that any new structure would have to consider the possibility of short-term working groups or task groups that would finish a job in a reasonable period so that we can take on some other task group in some other area. This will also enable us to get the best chemists to take up tasks for the Union.

A combination of the working-group structure and the Commission/Division structure may be worth considering. The Bureau is deliberating on the possible restructuring of the Union. Hopefully, by the time of the Lund Council, we shall have some definitive recommendations available.

I would like to say something about the Committee on Teaching Chemistry. CTC has done excellent work over recent years and has been the link between the Union and chemists in many countries (some of whom are not members of the Union). The Committee has generally been interested in the teaching of chemistry both at school and college levels. In general, CTC has been concerned more with the teaching of general chemistry rather than with highly specialized branches of chemistry. Soon there may be a need for IUPAC to look at the various other aspects of chemical education dealing with professional areas.

We have had several requests and suggestions from our Divisions and Commissions where they have expressed the need for chemical education

Bureau discuss the proposal for "think tanks".

activities in professional areas such as macromolecules, physical organic chemistry etc. We will have to examine whether it is indeed possible to have a standing committee on chemical education with a wider scope than the present committee on the teaching of chemistry. Such a new chemical education committee would have to not only take care of global issues in chemical education but also contribute to the work of the Commissions and Divisions of the Union. But this may be a difficult task. It would not be easy for a single committee/group to take care of the diverse educational inputs of the different divisions and commissions.

The Union will have to contribute more positively to the programmes of ICSU in the future. Some of the new programmes of ICSU are related to global issues such as the biosphere. ICSU also has interest in biotechnology. We have to make sure of IUPAC's role in these activities.

Affiliate programme useful

The Union is trying to involve a wider community of chemists, specially the younger generation. The affiliate programme has been useful in this direction. We need more people to participate in the work of the Union. The Union depends on how effectively we can involve the best chemists from all over the world.

I would like to draw the attention of the Council to the truly international role that the Union will have increasingly to assume in the years to come. There are many countries in the world today which are underdeveloped. Science is yet to make its mark in many of them. There are very few scientists, let alone chemists, in some of them. Yet, the future development of these countries will crucially depend on science and technology, and chemistry, in turn, will play a vital role. It is the moral obligation of those of us who are fortunate to become professionals in scientifically advanced countries, to see that the developing countries get the right opportunities and are able to make the right choices for development. I believe IUPAC can make its contribution in many ways including through education. We have to get more developing countries to become members or observers. We have to promote and encourage and we have to share.

"It is the moral obligation of those of us who are fortunate to become professionals in scientifically advanced countries, to see that the developing countries get the right opportunities and are able to make the right choices for development."

I would like to express my heartfelt thanks to the members of the Executive Council and the Bureau for their encouragement and support. My special thanks are due to Prof. Tom West, the Secretary General, Prof. Anders Björkman, the Treasurer, Dr Mo Williams, the Executive Secretary and all the members of the Secretariat. May I thank you all for your kind support and for your patient hearing.

Commission & Committee News

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Direct solar energy conversion through semiconductor and photoelectrochemistry

The Commission on Electrochemistry (I.3) approved a document on the "Terminology in semiconductor electrochemistry and photoelectrochemical energy conversion" at its meeting in Boston. The document, which will be published in *PAC*, clarifies nomenclature and adds to understanding in this very interdisciplinary area.

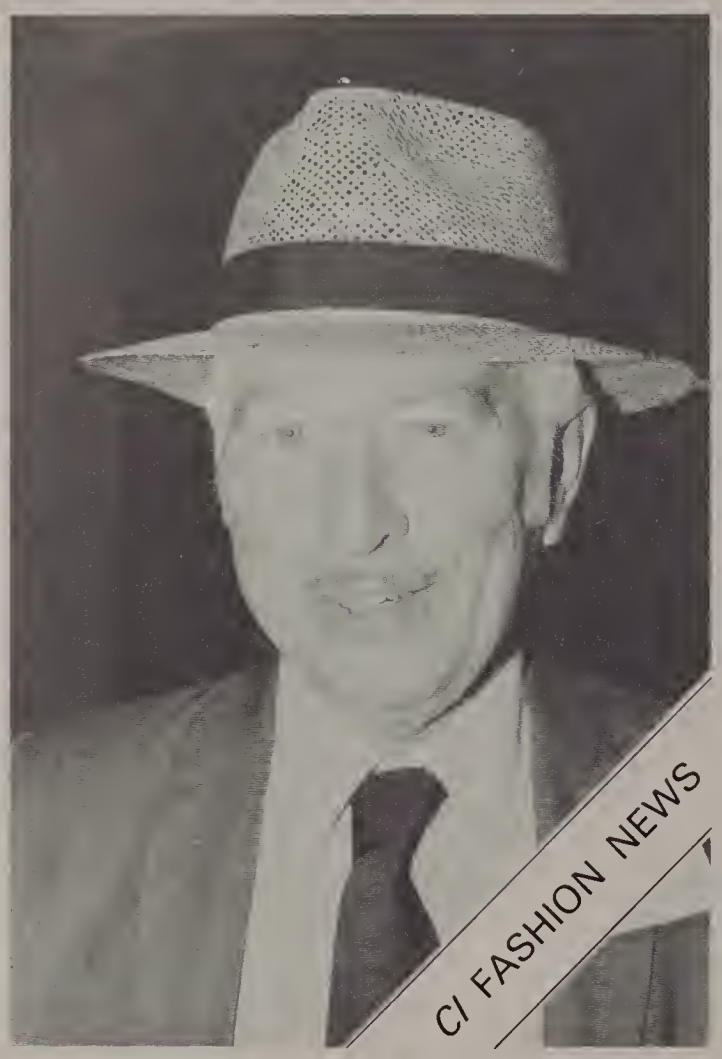
The Commission papers on "Electrochemical corrosion nomenclature" and on "Microelectronic ion-selective devices in electrochemistry" were ready for publication at the meeting and manuscripts on "Electrode potentials in nonaqueous solvents", "Real surface area measurements" and "Reference electrodes in molten salts" were ready to be mailed to experts.

Future projects in the areas of bioelectrochemistry and spectroelectrochemistry were also discussed. A Subcommittee on "Standard systems for electrode reaction rates" is to be created to bring together experts from various fields to this very important project.

Gerhard Gritzner

Metamorphosis of a Commission

At the open meeting of the IUPAC Organic Chemistry Division on Sunday 23 August the scope of the Commission on Physical Organic Chemistry (III.2) was provocatively stated to be "all of organic chemistry except photochemistry and the naming of compounds" by its Chairman, Professor Paul Müller of Geneva, Switzerland.



Fashion-conscious Organic Chemistry Division President Joe Bunnett sports the ideal hat for the Boston weather. Joe, who retired as Division President at the Assembly, declined an offer to become *CI* fashion model. For more Bunnett fashion see p. 86 of the May 1987 issue of *CI*.

Although he spoke somewhat in jest, Müller nevertheless described a situation that does exist. Commission III.2 is the only one in the Organic Chemistry Division that deals with experimental aspects of organic chemistry as practised not only by physical organic chemists but also by organic chemists primarily interested in synthesis and natural products. Immediately, the Commission is broadening its project to formulate guidelines for

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publication of physical organic research to encompass guidelines for publication of all experimental organic research (except for photochemistry). In its *Glossary of Terms* project, Commission III.2 finds itself also concerned at times with terms that are not exclusively or even primarily used by physical organic chemists.

It is anticipated that this broadened scope for Commission III.2 will be considered by the Division Committee in 1988 or 1989.

Joe Bunnett

Biotechnology

The Commission on Biotechnology (VI.2) at its meeting during the Boston General Assembly established a working plan for implementation of five projects and nine feasibility studies including the necessary collaborations with other IUPAC bodies.

A symposium entitled "Biotechnology in Chemistry", organized by the Commission and held Saturday evening 22 August, 1987 at the Boston General Assembly, was attended by over 100 people. The symposium identified areas of biotechnological importance to the chemical community.

Little opportunity was available for interaction with other commissions with interests in biotechnology. The groundwork was laid within the Commission for potentially useful interactions related to ongoing projects. Commission VI.2 again invites other IUPAC bodies to communicate with it about any of their relevant work in order to fulfil its coordinative role.

Several vacancies exist on Commission VI.2. The Commission is seeking active new members to pursue its projects.

The Commission reviewed a report on the 9th International Biotechnology Symposium, to be held in Washington, DC in August, 1992.

The next meeting of Commission VI.2 will take place in Paris during the 8th International Biotechnology Symposium in July 1988.

Lilia M. Gierasch

Publications

Oils, Fats and Derivatives

Since the publication in 1979 of the 6th edition of *Standard Methods for the Analysis of Oils, Fats and Derivatives* the Commission on Oils, Fats and Derivatives has continued the work of adapting methods contained in the 5th edition which had not been included in the 6th edition. In addition the Commission has adopted many new methods and these have been published in *PAC* over a number of issues.

The present volume — the 7th edition — is the 6th edition enlarged to include these new methods and the various amendments. The volume contains more than 80 standardized methods prepared following collaborative studies at the international level in well-equipped laboratories. They are thus suitable for adoption as reference methods. Many of the methods have been incorporated in legislation.

- Oleaginous seeds and fruits
- Oils and fats
- Glycerines
- Alkaline soaps

The sections include recommended preparation of samples, determination of physical and chemical characteristics using well-proven and modern techniques and the determination of quality, stability, foreign substances and additives.

The work is designed for use in industry, trade and international standards organizations. It is published in loose-leaf form in a ring binder. Further methods are planned and may be inserted in the binder. Purchasers are advised to register their interest direct with the publisher who will keep them informed when supplements are published.

The book is compiled by C. Paquot and A. Hautfenne and published by Blackwell Scientific Publications Ltd, Oxford. UK, 1987. xvii + 366 pp. ISBN 0 632 01586 1. Price £55.00.

Physical Chemistry of Colloids and Macromolecules

The IUPAC Symposium on the "Physical Chemistry of Colloids and Macromolecules" (the Svedberg Symposium) was held 22–24 August 1984, at Uppsala University, Sweden, to celebrate the 100th anniversary of the birth of Professor The(odor) Svedberg, born on 30 August 1884. The Symposium was attended by 220 scientists, of whom 100 were from abroad, representing 17 countries. In addition, 40 Swedish senior high school students (20 boys and 20 girls) attended by invitation on special fellowships. These students were selected by their teachers to be the best chemistry student of his/her high school. Most of the students had previously been Berzelius Fellows at the annual Berzelius Days for high school students, arranged by the Swedish Chemical Society.

The Symposium programme offered a total of 49 presentations, of which 10 were introductions and other short addresses, six were retrospective lectures on Svedberg's contributions to science, six were lectures on colloid and surface science, seven on sedimentation analysis of proteins and polysaccharides, and 20 on macromolecular solutions and gels. These areas of research, together with isotope and radiation studies, represent the main fields of activity of Svedberg and his students and associates.

The Symposium Volume contains the main addresses and the invited lectures. The retrospective lectures describe the intense and successful work of a great scientist in a wide area. We can follow how Svedberg's main interest in research gradually shifted from inorganic colloids to proteins and other macromolecules, and during the last period, after his retirement as professor of physical chemistry at 65, mainly to nuclear and radiation research. Svedberg's extensive activity in research formed the basis for three new departments of Uppsala University: Physical Chemistry, Biochemistry, and Nuclear Chemistry.

The main invited lectures describe current research in the "Svedberg areas". They reflect the importance of Svedberg's pioneering research on colloids and macromolecules. The development of ultracentrifugal sedimentation, and other preparative and analytical methods for protein research which followed, has made Uppsala a leading research centre in the field of protein analysis.

Polymer research started in the 1920s when the concept "macromolecules" was proposed and after a decade of studies and discussions generally accepted. In his introductory lecture, "Polymers in the 1920s", Professor Herman F. Mark gave an eyewitness report of this dramatic period of polymer science. Svedberg's decisive contribution to support of the macromolecular concept, as pointed out by Herman Mark, was in his measurements of molecular weight (mass), using the ultracentrifuge which he constructed in 1923 to 1926.

Svedberg's broad interests in research covered a wide field in physics, chemistry, biology and tech-

nology, and a life-long devotion to botany, as described by his close associate through several decades, Professor Sven Brohult, in his general lecture on "Svedberg as a Scientist".

The retrospective lectures on Svedberg's contributions to research present his early studies on colloid chemistry (P. Stenius), his pioneering and extensive protein research (K. O. Pedersen) and his studies on polysaccharides (I. Jullander) and synthetic polymers (P. O. Kinell). A personal account of the development of "The First Svedberg Centrifuges" in 1923–26 is given by one of Svedberg's students at this time, Dr J. B. Nichols, who participated in this work both at the University of Wisconsin and at Uppsala University. One of the retrospective lectures, "Contributions of Svedberg to Nuclear and Radiation Research" (B. Larsson and S. Kullander) reviews Svedberg's life-long interest in this field, which resulted in the formation of the Gustaf Werner Institute as a department of Uppsala University.

The invited lectures on *colloid and surface science*, included in the Symposium Volume, are reviews of three active areas of research: surface-enhanced Raman scattering, which gives the intense colour of many colloids (M. Kerker), the colloidal behaviour of surfactant systems (B. Lindman and H. Wennerström), and the use of colloidal silica particles for centrifugal separation of biological materials (H. Pertoft and T. C. Laurent).

Ultracentrifugal sedimentation, pioneered by Svedberg for molecular weight (mass) measurements, is now a sophisticated technique supported by advanced theory (L.-O. Sundelöf) and developed as a source of more general information in macromolecules in solution (A. J. Staverman), especially for proteins in aqueous solution (H. Suzuki). Recent advances in thermal diffusion and sedimentation, another field of Svedberg's research interests, is also presented in the Symposium Volume (F. J. Bonner).

Macromolecular solutions and gels are extensively studied, e.g. by light scattering for molecular weight (mass) measurements (H. Benoit, M. Benmouna, C. Strazielle and C. Cesteros), and by Carbon-13 NMR for studies of association and phase structure in polymer gels (B. Lindstedt and P. Flodin). Remarkable success in analysis of proteins in solution is achieved by high performance electrophoresis (S. Hjertén and M. Zhu) and group-specific adsorbents (J. Porath, M. Belew, F. Maisano and B. Olin) as reported in the Symposium Volume.

Svedberg was a man of many interests and talents. As an introduction to an exhibition "The Svedberg — Scientist, Writer, Artist", opened on 22 August at the University Library "Carolina Rediviva", three short lectures were given: "Svedberg as an Author" by N. Gralén, "Svedberg as a Botanist" by C.-J. Clemedson, and "Svedberg as an Artist" by P. Ahlström.

They are included in the Symposium Volume to give perspectives on Svedberg's remarkable achievements in many fields of human endeavour. This is further illustrated in the after-dinner speech on "Svedberg as a Promotor of Science and Technology" by N. Gralén, given at the Symposium Banquet at Uppsala Castle on 23 August.

In the final chapter of the Symposium Volume, Svedberg speaks for himself on science, technology, society, and the human mind. It is in a lecture on "The Aims and the Means of Research" given by Svedberg on 10 September, 1947, at the inauguration of an industrial research laboratory. This lecture presents Svedberg's extensive knowledge of science and technology and his confidence in and enthusiasm for science as the basis for human progress. But he also expresses his deep concern and responsibility for the misuse of science applications. The threat of nuclear devastation and the end of our civilization was clear to Svedberg in 1947.

The book is edited by Bengt Rånby and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1987. viii + 162pp. ISBN 0 632 01536 5. Price £18.00/US-$25.00.

Pesticide Science and Biotechnology

IUPAC has sponsored a series of international congresses of pesticide chemistry. The Sixth Congress was held in Ottawa from 10 to 15 August 1986 (see *CI*, Vol. 9, No. 1, pp. 12–21, 1987). These congresses are the only international scientific meetings that deal with all aspects of pesticide science and toxicology, notably synthesis, mode of action, formulation, fate and effects.

As with earlier Congresses, therefore, the scientific programme for the Ottawa meeting encompassed all the major areas of pesticide chemistry and related areas such as toxicology and regulatory issues. However, greater emphasis was given to the fate and effects of pesticides in the environment and to the current status of those aspects of biotechnology relevant to pesticide science.

In his plenary lecture, Dr Geissbühler stressed the importance of the biorational approach in the design of new bioactive molecules. He also felt that biotechnology will feature as an important component of future research approaches. The potential for biotechnology as an alternative strategy for crop protection was also the theme of a special symposium held as part of the Congress.

The Congress programme comprised both symposia and poster/workshop presentations, the latter being chosen as the main medium for com-

The Pesticide Congress programme comprised both symposia and poster/workshop presentations.

munication. The invited speakers in the symposia were asked not only to review current progress but also to prognosticate on the future of their specific field of research. The posters were intentionally separated from the workshops in an endeavour to stimulate an active discussion involving the participants. The invited speakers in the workshop sessions were asked to concentrate on specific problems associated with each subtopic.

The Scientific Programme Committee decided that the Proceedings of this Congress should be published as a single volume, with emphasis on the themes of pesticides in agriculture and the environment. A selection was made of the presentations, generally two from each sub-topic representative of the sub-topic themes. These, together with all the symposium presentations and the plenary talks, make up the Proceedings.

The contents of *Pesticide Science and Biotechnology: Proceedings of the Sixth International Congress of Pesticide Chemistry* are divided into the following sections:

- Synthesis of pesticides and bioregulators
- Chemistry and bioactivity of natural products and prototypes
- Chemical and biological basis of pesticide activity and resistance
- Progress and development in formulation chemistry and technology
- Pesticide residue methodology
- Environmental fates and effects
- Metabolism in plants and animals
- Pesticide toxicology and human health.

The book is edited by R. Greenhalgh and T. R. Roberts and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1987. xiii + 624pp. ISBN 0 632 01618 3. Price £69.50/US-$87.00.

Phosphorus chemistry

Numbers 1/2 and 3/4 of Volume 30, *Phosphorus and Sulfur and the Related Elements* (1987) contain the proceedings of the 10th International Conference on Phosphorus Chemistry held at the University of Bonn, FRG, 31 August–6 September 1986. They consist of four-page synopses of the lectures as well as the abstracts of the posters presented at the conference.

Part I (published as Number 1/2) contains a preface entitled "Organophosphorus chemistry today" by J. I. G. Cadogan and Philip K. G. Hodgson (UK), Section A: "Reactivity and Mechanisms of Phosphorus Compounds" and Section B: "Phosphorus in Particular Coordination and Bonding".

Part II (published as Number 3/4) contains Section C: "Biochemistry of Phosphorus", Section D: "Applied Phosphorus Chemistry" and all the poster abstracts.

Crosslinked epoxies

Volume 7 of *Makromol. Chem., Macromol. Symp.* (1987) contains 12 main lectures presented at the 9th Discussion Conference "Crosslinked Epoxies" held in Prague, 14–17 July 1986.

The contributions cover synthetic, kinetic, structural and dynamic problems of epoxies as well as physical and material properties seen from both the theoretical and practical points of view.

Biological substances

Biological substances. International Standards and Reference Reagents 1986 tabulates key information on the availability and specifications of international biological standards and international biological reference reagents. Biological standards, which occupy the most extensive part of the book, are established for use in the calibration of the activity of national or working standards and for the expression of their biological activity in international units. Samples of standard preparations are intended for use in laboratory assays only.

The book provides an updated list of standards for antibiotics, antibodies, antigens, blood products and related substances, endocrinological and related substances, and a miscellaneous group of substances. For each group of substances, standard preparations are listed in alphabetical order under the name and address of the laboratory that holds and distributes the substances. Each is identified by name and then characterized in terms of its biological activity, expressed as the total number of international units per ampoule; a weight definition of the unit, where necessary; the form in which the substance is available from the laboratory; the year of establishment of the standard; and pertinent references to the literature.

The second main part of the book presents similar information for international biological reference reagents, which are established mainly for the purpose of providing reference materials of high specificity for the identification of micro-organisms or their products as well as for the identification of other biological substances of interest in the diagnosis of diseases.

A concluding section lists new biological standards under consideration together with biological and pharmaceutical reference materials that have been discontinued.

The publication of this authoritative list represents part of WHO's effort to ensure uniformity throughout the world in the designation of the potency or specificity of biological preparations that are used in the prophylaxis, therapy, or diagnosis of disease.

The volume is published by the World Health Organization, Geneva, 1987. 94 pp. ISBN 92 4 154213 6. Price Sw.fr.15.-/US-$9.00. Available in English. French and Spanish versions are in preparation.

PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Bio-electrochemistry

The June 1987 issue of *PAC* contains the plenary lectures presented at the 3rd International Conference on Bioinorganic Chemistry, Noordwijkerhout, the Netherlands, 6–10 July 1987. They include a paper on bioelectrochemistry by H. Allen O. Hill (Oxford, UK).

In this paper, Hill discusses direct electron transfer reactions of redox proteins at a variety of electrodes, including modified gold, pyrolytic graphite and ruthenium oxide. He stresses that the electron transfer occurs without mediation. For many redox proteins, the rate of the electron transfer depends critically on the presence in solution or, to be more

H. Allen O. Hill who has used ferrocenes in electrochemical immunoassays.

correct, at the electrode surface, of divalent, trivalent or even tetravalent metal ions or complexes.

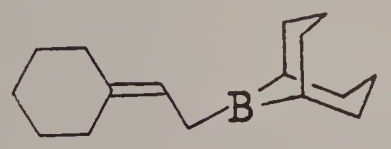
The dependence on the type of promoter used to modify the gold surface, the nature of complexes formed with added metal salts and the structures of the adsorbed redox protein are examined by Hill in this paper. In instances where direct electron transfer is very low, as is the case at present with many potentially useful enzymes, indirect mediated electron transfer is used.

Of particular value as mediators are ferrocenes, not only because they take part in rapid, reversible electrochemistry, but also because of the wide variety of compounds that can be prepared. Their use in a variety of sensors is illustrated in electrochemical assays for glucose, ATP, creatine kinase, hydrogen peroxide, and cholesterol. Their application in electrochemical immunoassays is illustrated by the analysis of the drug, lidocaine.

Allylboranes

Some aspects of the construction of cyclic, cage, and acyclic organic and organoboron systems using triallylborane and various new allylic boranes were described in a lecture on "Allylboranes — molecular design" presented at IMEBORON VI: 6th International Symposium on Boron Chemistry held at Bechyně, Czechoslovakia, 22–26 June 1987.

The lecture was by Yuri Bubnov of the N. D. Zelinsky Institute of Organic Chemistry, Moscow, USSR. Bubnov pointed out that all known allylborane reactions could be classified into six patterns and principles of their reactions formulated. He said that one can now predict the courses of many "new" reactions of this type of compound.



One of the novel allylboranes synthesized by Bubnov.

The plenary lectures from IMEBORON VI are published in the July 1987 issue of *PAC*. They include papers on "Kinetics and mechanism of the thermolysis and photolysis of binary boranes" by Norman Greenwood and Robert Greatrex (Leeds, UK); "Organoboranes for synthesis — substitution with retention" by Herbert Brown and Bakthan Singaram (Purdue University, USA), and "After a third of a century in organoboron chemistry" by Roland Köster (Max-Planck-Institut für Kohlenforschung, FRG).

Recent Reports

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

A descriptive classification of the electron spectroscopies (Recommendations 1987)

The publication supplements an earlier IUPAC publication on electron spectroscopy and is intended to provide a source of reference for those interested in discovering the extent to which one or other of the electron spectroscopies might be of value in a particular area of work. The criterion for inclusion is principally that the use of an energy analyser or monochromator passing selected energies of electrons forms an essential part of the experiment. The different methods are grouped according to the underlying physical process which is involved. Each section is described in detail with all of the sub-divisions which could be discerned as distinctly separate according to the experimental features which are seen to be dominant.

This report was prepared by the Commission on Molecular Structure and Spectroscopy (I.5) and published in PAC, *Vol. 59, No. 10, pp. 1407–1418, 1987.*

Determination of total and 'free' hexane content in extraction meals: Results of a collaborative study and the standardized method

The development, by collaborative study, of a standardized method for the determination of total residual "hexane" content in extraction meals is described. The procedure involves the complete desorption of hydrocarbons by heating the moistened meal in a closed flash. The hydrocarbons content of the headspace is then determined by GLC using a capillary or packed column and is expressed in terms of hexane content. If the extraction meal is not moistened, desorption of hexane into the headspace is incomplete. Conventionally the "free" hexane content is the quantity of hexane determined on the sample as such without preliminary moistening.

This report was prepared by the Commission on Oils, Fats and Derivatives (VI.3) and published in PAC, *Vol. 59, No. 10, pp. 1407–1418, 1987.*

Potential contamination of groundwater by pesticides

The objectives of this review are to summarize existing information on the occurrence of pesticides in groundwater and processes resulting in their detection; to identify existing technologies, and to describe missing information needed to make assessments and predictions. Validated data on the occurrence of pesticides in groundwater are still limited. Pesticides can reach groundwater following normal agricultural usage and improper disposal and handling. Three frequently detected pesticides, aldicarb, atrazine, and DBCP, are considered in detail, while other reported occurrences are summarized. Mobility and transformation processes that determine the amount of a pesticide actually reaching groundwater are described. Transformation processes include microbial metabolism and chemical reactions. While these processes are well researched for the root zone, fewer data are available on the subsoil and saturated zone. Other factors influencing the rate and amount of pesticide infiltration include the soil–subsoil–groundwater structure, depth of groundwater, macropore flow, and rainfall or water management practices. An attempt is made to quantify the pesticide properties and field conditions to predict their potential for leaching. Experimental and mathematical models are described and the importance of well designed field studies is emphasized.

This report was prepared by the Commission on Pesticide Chemistry (VI.5) and published in PAC, *Vol. 59, No. 10, pp. 1419–1446, 1987.*

Conferences

Neutron capture therapy

The 3rd International Symposium on Neutron Capture Therapy will be held in Bremen, FRG from 31 May to 3 June 1988. Topics to be covered include: neutron production and beam design; synthesis and biological testing of boronated tumour seekers; radiobiology of high-LET particles; experience with clinical therapy of brain tumours and advances towards treatment of other tumours. *Further information from Prof. D. Gabel, Department of Chemistry, University of Bremen, Box 330 440, D-2800 Bremen 33, Federal Republic of Germany.*

Chemical Congress of North America

The Third Chemical Congress of North America will be held at the Metro Toronto Convention Centre, Toronto, Canada from 5 to 11 June 1988. The Congress will include the 71st Canadian Chemical Conference; the 195th National Meeting of the American Chemical Society and the 23rd National Meeting of the Sociedad Química de México. *For further information contact: Anne Alper, The Chemical Institute of Canada, 300-1785 Alta Vista Drive, Ottawa, ON, Canada.*

Chemicals in the Environment

The 3rd FECS Conference on Chemistry and the Environment will be concerned with Risk Assessment. The conference will discuss the predicted or actual frequency of occurrence of an adverse effect of a chemical substance or mixture from a given exposure to the environment. The process of decision-making applied to such problems where there are a variety of possible outcomes (and it is uncertain which event will happen) will be discussed in depth.

The conference will take place at the University of Surrey, Guildford, UK from 11 to 14 July 1988. *Further information from Dr John F. Gibson, Secretary (Scientific), Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.*

Bio-organic Heterocycles

The 5th FECHEM Conference on Heterocycles in Bio-organic Chemistry will be held at Bechyně Castle, Czechoslovakia, 30 May–2 June, 1988. *Further information from Dr Antonin Holý, Institute of Organic Chemistry and Biochemistry, Czechoslovak Academy of Sciences, Flemingovo nam. 2, 166 10 Praha 6, Czechoslovakia.*

Surface Interactions

An International Symposium on Surface Interactions will be held at Neve Ilan, Jerusalem Hills, Israel, 13–18 March 1988. Topics of the meeting are: theoretical models of interaction at and between surfaces; intersurface force studies (techniques and results); structure of the interface and of adsorbed species; chemical modification of surfaces; and dynamics of intersurface interactions. *Address for further details: Prof. Jacob Klein, Chairman, Organizing Committee, Symposium on Surface Interactions, Department of Polymer Research, Weizmann Institute of Science, Rehovot 76100, Israel.*

IUPAC 88 KYOTO

16th International Symposium on the Chemistry of Natural Products

May 29–June 3, 1988
Kyoto, Japan

Kyoto International Conference Hall.

This symposium, which will take place in the Kyoto International Conference Hall, is concerned with all aspects of the chemistry of natural products — both academic and industrial.

The scientific programme will consist of a plenary, section and colloquium lectures on special topics and poster sessions. The plenary lectures are:

- On the biosynthesis of penicillin and cephalosporin (J. E. Baldwin, Oxford Univ., UK).
- New reactions for use in natural products chemistry (D. H. R. Barton, Texas A&M Univ., USA).
- Biosynthetic and synthetic studies on the pigments of life (A. R. Battersby (Cambridge Univ., UK).
- Studies in organic synthesis (A. Eschenmoser, ETH, Switzerland).
- Recent work on the total synthesis of polycyclic alkaloids (C. H. Heathcock, California Univ., USA).
- Studies on bioactive substances from marine animals (Y. Hirata, Meijo Univ., Japan).
- Natural products synthesis: palytoxin (Y. Kishi, Harvard Univ., USA).
- Some carbon–carbon bond forming reactions. Mechanism and stereochemistry (S. Masamune, MIT, USA).
- Contributions to the chemistry of β-lactam antibiotics (W. Nagata, Shionogi and Co., Japan).
- The biochemical evolution of terpenes to sterols (G. Ourisson, Inst. de Chimie des Subst. Nat., France).
- Chemical structure and architecture of membrane proteins (Yu. A. Ovchinnikov, Shemyakin Inst. of Bio-organic Chemistry, USSR).
- Slime molds (Myxomycetes) as source of new biologically active compounds (W. Steglich, Univ. of Bonn, FRG).

The topics for the 40 or 50 section lectures are:

1. Isolation and structure elucidation of natural products.
2. Syntheses of natural products.
3. Natural products of biological importance.
4. Dynamic aspects in natural products.

Five or six colloquium lectures will be given on each of the following topics:

1. Marine natural products.

Guy Ourisson, who will lecture on "The biochemical evolution of terpenes to sterols".

2. Chemical communication between bioorganisms.
3. Molecular recognition in natural products.
4. Computer use in natural product chemistry.

The registration fees for the symposium are (before/after March 16): regular participant (Yen 40 000/Yen 50 000); student member (Yen 20 000/ Yen 25 000); accompanying person (Yen 10 000/ Yen 10 000). IUPAC Affiliates are entitled to a 10% reduction in the fee.

The official language of the symposium will be English. No simultaneous translation will be provided. The plenary, section and colloquium lectures will be published by Blackwell Scientific Publications Ltd.

The symposium social activities will include a reception, an excursion and a banquet. An exhibition of chemical equipment, reagents, books and other materials will also be held.

Accommodation will be available in hotels located along the subway route for easy access to the Kyoto International Conference Hall. The room rates per night (excluding meals) range from Yen 6800 to Yen 12 000 (single) and Yen 10 000 to Yen 16 200 (twin).

Kyoto was the capital of Japan for more than 10 centuries before the capital was moved to Tokyo in 1868. It is the cradle of Japanese culture and the spiritual home for all Japanese people. The climate there is generally mild and the mean temperature about 20°C.

11th Prague Discussion Conference: Chemical and physical phenomena in the ageing of polymers

Prague, Czechoslovakia, 11–14 July 1988

This conference, which will be held at the Institute of Macromolecular Chemistry in Prague, will consider important features and essential processes involved in the environmental ageing of technical and new polymers. It attempts to combine the chemical and physical aspects of the degradation and stabilization of polymers and the long-term life of technical polymers.

The conference will consist of 12 main lectures and 12 short special lectures as well as contributed papers presented as posters. The specific topics of the conference are:

1. Processes induced by electromagnetic radiation and their consequences in polymer properties. Influence of morphology, structural defects and impurities in polymers. Photostabilization.
2. Thermally induced transformations of polymers. Impact of active and aggressive environmental components. Cooperation effects in stabilizer mixtures.
3. Mechanodegradation, fatigue phenomena, cracking, crazing. Phenomena of structural relaxation (physical ageing). Migration of additives.
4. Relative role of physical and chemical deteriogens in the testing of polymers using accelerated tests. Rating of weathering. Polymer lifetime prediction.

A panel discussion on "Topics in processing and long-term stabilization of technical polymers" is also planned.

The conference language is English. The main lectures will be published in a special issue of *Die Makromolekulare Chemie*.

The registration fee will be in the range US-$110 to US-$120 with a 10% reduction for IUPAC Affiliates. Accommodation will be available in halls of residence within easy reach of the Institute by public transport.

The temperature in Prague in July is usually 19 to 20°C.

7th IUPAC Conference on Organic Synthesis

Nancy, France, 4–7 July, 1988

The conference will be formally opened at the "Palais des Congrès" of Nancy on Monday 4 July. The scientific programme will consist of plenary and invited lectures and poster sessions. The plenary lectures are:

- The synthesis of natural products using radical reactions (D. Barton, College Station, USA).
- Recent advances in the synthesis of polyoxygenated natural products (S. Danishefsky, New Haven, USA).
- Synthesis design logic and SYNGEN program (J. B. Hendrickson, Waltham, USA).
- Multiple asymmetric induction and its application to natural product synthesis (S. Masamune,

Organic synthesis plenary lecturers: Left: J. B. Hendrickson (USA); bottom: R. Noyori (Japan); right: B. M. Trost (USA); top: H. Viehe (Belgium).

Cambridge, USA).

- Catalytic asymmetric induction (R. Noyori, Nagoya, Japan).
- Assymetric C–C bond formation using organometallic chemistry (M. T. Reetz, Marburg, FRG).
- Super-bases for organic synthesis (M. Schlosser, Lausanne, Switzerland).
- Templates for selective transformations (B. M. Trost, Stanford, USA).
- Computer assistance in the design of syntheses and a new generation of computer programs for the solution of chemical problems by molecular logic (I. Ugi, Munich, FRG).
- Substituent effects in radical chemistry (H. Viehe, Louvain, Belgium).

The poster topics are:

- New reagents for organic synthesis.
- Single electron transfer and radical synthesis in synthesis.
- Asymmetric synthesis.
- Automation and computers in synthesis.

The official languages of the conference are English and French although English is strongly recommended and requested for the abstracts. Conference lectures will be published in *Pure and Applied Chemistry*.

The registration fees are: active participant, 1400 FF; accompanying person, 600 FF and student, 700 FF. A 10% reduction is available for the first 200 Affiliates to register. Accommodation is available in hotels and student halls of residence. Social events include a cocktail party, excursion, ballet and buffet campagnard.

Nancy is an old and large academic centre with universities of sciences and medicine and of literature and law and also the National Polytechnic Institute. It is equally close to Paris, Burgundy, Brussels and Luxembourg. The weather in Nancy at the beginning of July is usually fair with daytime temperatures generally ranging from 18 to 26°C. Rainfall during this period is generally scant.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1988

Biological Reference Materials

4–6 May. 3rd International Symposium on Biological Reference Materials. Bayreuth, Federal Republic of Germany.
(Dr Marcus Stoeppler, Institut für Chemie, KFA Postfach 1913, D5170 Jülich, Federal Republic of Germany.)

Drugs in Competitive Athletics

29 May–1 June. 1st International Symposium on Drugs in Competitive Athletics. Islands Brioni, Yugloslavia.
(Prof. Mirna Mikac-Dević, Institute of Clinical Chemistry, Medical High School, Hospital "Dr. M. Stojanovic", Vinogradska 29, 41000 Zagreb, Yugoslavia.)

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1–5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubère, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-lès-Nancy Cédex, France.)

Modified Polymers

5–8 July. 7th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia.
(Dr A. Romanov, Polymer Institute CCR of the Slovak Academy of Sciences, 842 36 Bratislava, Czechoslovakia.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Photochemistry

17–23 July. 12th International Symposium on Photochemistry. Bologna, Italy.
(Prof. V. Balzani, Dipartimento di Chimica, Università degli studi, Via Selmi 2, 40126 Bologna, Italy.)

Poly(Vinyl Chloride)

18–21 July. 31st Microsymposium on Macromolecules: Poly(Vinyl Chloride). Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshidi-machi, Sakyo-ku, Kyoto 606, Japan.)

Inorganic Ring Systems

8–12 August. 5th International Symposium on Inorganic Ring Systems. Amherst, Mass., USA.
(Prof. R. R. Holmes, Department of Chemistry, University of Massachusetts, Amherst, MA 01003, USA.)

Carbohydrates

14–19 August. 14th International Carbohydrate Symposium. Stockholm, Sweden.
(Prof. Per J. Garegg, Department of Organic Chemistry, Arrhenius Laboratory, University of Stockholm, S-106 91 Stockholm, Sweden.)

Solution Chemistry

15–18 August. 19th International Conference on Solution Chemistry. Lund, Sweden.
(Prof. Sten Ahrland, Inorganic Chemistry 1, Chemical Center, University of Lund, PO Box 124, S-221 00 Lund, Sweden.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Nator, Maiji College of Pharmacy, 1-22-1, Tanashi-shi, Tokyo, Japan.)

Physical Organic Chemistry

21–27 August. 9th International Conference on Physical Organic Chemistry. Regensburg, Federal Republic of Germany.
(Prof. J. Sauer, University of Regensburg, Institut für Organische Chemie, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Solubility Phenomena

23–26 August. 3rd International Symposium on Solubility Phenomena. Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Department of Chemistry, University of Surrey, Guildford, Surrey GU2 5XH, UK.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

Coordination Chemistry

29 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. J. de O. Cabral, Department of Chemistry, Faculdade de Ciências, 4000 Porto, Portugal.)

Molecules and Molecular Crystals

29 August–3 September. International Symposium on the Electronic Structure and Properties of Molecules and Molecular Crystals. Cavtat-Dubrovnik, Yugoslavia.
(Prof. Z. B. Maksic, Ruder Bošković Institute, 41001 Zagreb, Bijenička 54, Croatia, Yugoslavia.)

Macrocyclic Chemistry

4–8 September. 13th International Symposium on Macrocyclic Chemistry. Hamburg, Federal Republic of Germany.
(Prof. A. Knöchel, Institut für Anorganische und Angewandte Chemie, Universität Hamburg, Martin-Luther-King-Platz 6, 2000 Hamburg 13, Federal Republic of Germany.)

Organometallic Chemistry

4–9 September. 13th International Conference on Organometallic Chemistry. Turin, Italy.
(Prof. Luciano Milone, Istituto di Chimica Generale ed Inorganica, Facoltà di Farmacia, Università di Torino, Via P. Giuria 9, I-10125 Turin, Italy.)

Raman Spectroscopy

5–9 September. XIth International Conference on Raman Spectroscopy. London, UK.
(Dr John F. Gibson, Secretary (Scientific) Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.)

1989

Coordination Chemistry

2–7 July. 27th International Conference on Coordination Chemistry. Queensland, Australia.
(Prof. C. J. Hawkins, Department of Chemistry, University of Queensland, Australia.)

Analytical Chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Dr J. D. R. Thomas, Applied Chemistry Department, UWIST, PO Box 13, Cardiff CF1 3XF, UK.)

IUPAC Congress

2–7 August. 32nd International Congress. Stockholm, Sweden.
(IUPAC, c/o Stockholm Convention Bureau, PO Box 6911, S-102 39 Stockholm, Sweden.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Ichiro Murata, Dept. of Chemistry, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan.)

1990

Natural Products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Prof. Sukh Dev, Malti-Chem Research Centre, Nandesari, Baroda-39340, India.)

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Dr W. Fritsche, Gesellschaft Deutscher Chemiker, Carl Bosch Haus, Postfach 900440 Varrentrappstrasse 40-42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

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IUPAC Secretariat

Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)
Telephone: + 44 (865) 717744 Telex: 83220 IUPAC G Telegrams: IUPAC OXFORD
Fax: + 44 (865) 726753 (Groups 2 & 3) attn. IUPAC

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 41 countries, each represented by a national organization, such as an academy of science or research council.

National Adhering Organizations

Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
Asociación Química Argentina **(Argentina)**
Australian Academy of Science **(Australia)**
Verein Österreichischer Chemiker **(Austria)**
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Chemistry International

IUPAC

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All correspondence to be addressed to The Editor, Chemistry International, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, England (telephone: + 44 (865) 717744).

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Front cover: Manufacture of large steel cylinders in Bombay, India (*Photo courtesy World Bank/UNESCO/R. Witlin*).

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Erratum: The two captions for the photographs on page 45 of this issue have been transposed in error. The photograph on the left shows Dr Mazar Barnett (left) and Prof. Arvia (right). The photograph on the right shows Prof. Calado (right) and Dr Williams (left).

Health for all — all for health

"HEALTH is a state of COMPLETE physical, mental and social well being and not merely the ABSENCE of disease or infirmity." (WHO Constitution)

The seventh of April 1988 marks the fortieth anniversary of the World Health Organization. The World Health Assembly, representing the 166 Member States, has decided to use the occasion to stimulate national action for health development through the involvement of governments, voluntary organizations, professional associations and interested individuals.

The following is the text of a message from Dr H. Mahler, WHO Director-General for World Health Day, 1988:

"Forty years have elapsed since men and women of goodwill and foresight laid the foundations of the World Health Organization.

For the first time in history there would be a truly global cooperative enterprise to protect and promote human health. Health which is rightly defined in the WHO Constitution as not merely the absence of disease or infirmity but as a state of complete physical, mental and social well being.

Remarkable progress had been made in science, technology and medicine. This was consolidated in the course of the first 30 years of WHO's existence. Sufficient know-how and expertise became available to ensure health care for all the inhabitants of our planet.

There is, however, a wide gulf between the health 'haves' and the health 'have nots'. We unfortunately are still not equals in health on our spaceship earth. For instance:

Nearly 1000 million people are trapped in the vicious circle of poverty, malnutrition, disease and despair that saps their energy, reduces their work capacity and limits their ability to plan for the future.

Average life expectancy fluctuates between over 70 in some countries to barely 50 in others.

In most developing countries, from nearly 100 to more than 200 out of 1000 infants born alive die during their first year, although industrialized countries have succeeded in bringing this rate down to between 10 and 20, and even less.

Women in most poor countries have a 200 times greater risk of dying during pregnancy and delivery than women in a rich country.

It became a matter of equity and social justice to make health progress available to all people through new approaches, new strategies and better management of available resources.

Within WHO, 166 Member States are now unanimously committed to Health for All: a strategy firmly anchored on four basic pillars:

Women in most poor countries have a 200 times greater risk of dying during pregnancy and delivery than women in a rich country. (*Photo courtesy WHO*).

Nearly 1000 million people are trapped in the vicious circle of poverty, malnutrition, disease and despair that saps their energy, reduces their work capacity and limits their ability to plan for the future. In this photograph, malaria surveillance workers take blood samples from suspected cases in a Rajasthan village, India (*Photo courtesy WHO*)

- Technology — not necessarily sophisticated but APPROPRIATE technology and by appropriate I mean not only scientifically sound but socially acceptable and economically affordable.
- Political will to improve health so as to enable people to lead economically productive and socially rewarding lives.
- Health sector cooperation with other key development areas such as education, agriculture, industry and information.
- Last, but by no means least, community and individual participation in the quest for better health: All for Health by the Year 2000.

The Alma–Ata Declaration on primary health care, now 10 years old, clearly mapped the road we are firmly engaged in. It is along this road that we should go forward, all of us, men and women everywhere who are not only the objects of development but are in fact the very subjects of that development and quite particularly of health development.

Men and women active in education, agriculture, industry, information and so many other different walks of life recognizing the mutually beneficial effects of development, in harmony with the protection and promotion of good health.

People everywhere, including top-level political and spiritual leaders, from north and south, east and west, recognizing beyond all their differences that health is good for all people and essential for human progress. That there is both economic value and social justice in health. Surely we must all recognize that health is not everything, but that there is nothing without health. In the interest of the human race there must be Health for All and All for Health."

For further information on WHO and World Health Day contact World Health Organization, CH–1211 Geneva 27, Switzerland. Tel. + 41 (22) 91 21 11. Telex: UNISANTE GENEVA 27821. Fax: (0-2) 91 07 46.

Environmental Health Criteria

There are now 63 titles in the *Environmental Health Criteria Series*. The series is published under the joint sponsorship of the United Nations Environment Programme (UNEP), the International Labour Organization (ILO) and the World Health Organization (WHO). It provides an authoritative assessment of what is known about the effects of chemical substances and a number of physical factors on human health and on the quality of the environment. It furnishes the scientific information on which national health and other authorities can base suitable control measures where these are needed, and it gives guidelines for setting exposure limits consistent with the protection of human health in the general environment and in the workplace. Where the substances considered occur in nature (as lead and titanium, for instance), the natural exposure is taken into account. Inevitably, however, the stress is on exposure to such substances during and after manufacture and as wastes and on entirely man-made products (chemicals for industrial use, pesticides and lasers, for example).

Each volume is concerned with a single sub-

stance or group of substances, selected from an internationally agreed list of priorities. Drafts are prepared by individual experts or national institutions and are then subjected to extensive revision by one or more international groups of experts in order to ensure that they are as accurate and comprehensive as possible.

The series also comprises a number of volumes describing the principles and methods that are applied in environmental investigation; those published so far cover toxicity testing, the conduct of studies in environmental epidemiology, and exposure monitoring in relation to pregnancy.

The volumes that deal with chemical substances are for the most part the outcome of work performed by the International Programme on Chemical Safety (IPCS); this is a joint venture of UNEP, ILO and WHO. Those that concern sources of non-ionizing radiation are prepared jointly by the International Radiation Protection Association (IRPA) and WHO, with funding from UNEP.

Publications in the *Environmental Health Criteria Series* deal with the effects on human health and the environment of exposure to individual chemical compounds or groups of compounds (red covers). The series also includes a number of publications dealing with the methodology of data interpretation and risk assessment (yellow covers).

The titles in the series are:

1. Mercury
2. Polychlorinated Biphenyls and Terphenyls
3. Lead
4. Oxides of Nitrogen
5. Nitrates, Nitrites, and *N*-Nitroso Compounds
6. Principles and Methods for Evaluating the Toxicity of Chemicals, Part 1
7. Photochemical Oxidants
8. Sulfur Oxides and Suspended Particulate Matter
9. DDT and its Derivatives
10. Carbon Disulfide
11. Mycotoxins
12. Noise
13. Carbon Monoxide
14. Ultraviolet Radiation
15. Tin and Organotin Compounds
16. Radiofrequency and Microwaves
17. Manganese
18. Arsenic
19. Hydrogen Sulfide
20. Selected Petroleum Products
21. Chlorine and Hydrogen Chloride
22. Ultrasound
23. Lasers and Optical Radiation
24. Titanium
25. Selected Radionuclides
26. Styrene
27. Guidelines on Studies in Environmental Epidemiology
28. Acrylonitrile
29. 2,4-Dichlorophenoxyacetic Acid (2,4-D)
30. Principles for Evaluating Health Risks to Progeny Associated with Exposure to Chemicals during Pregnancy
31. Tetrachloroethylene
32. Methylene Chloride
33. Epichlorohydrin
34. Chlordane
35. Extremely Low Frequency (ELF) Fields
36. Fluorides and Fluorine
37. Aquatic (Marine and Freshwater) Biotoxins
38. Heptachlor
39. Paraquat and Diquat
40. Endosulfan
41. Quintozene
42. Tecnazene
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49. Acrylamide
50. Trichloroethylene
51. Guide to Short-Term Tests for Detecting Mutagenic and Carcinogenic Chemicals
52. Toluene
53. Asbestos and Other Natural Mineral Fibres
54. Ammonia
55. Ethylene Oxide
56. Propylene Oxide
57. Principles of Toxicokinetic Studies
58. Selenium
59. Principles for Evaluating Health Risks from Chemicals During Infancy and Early Childhood: The Need for a Special Approach
60. Principles and Methods for The Assessment of Neurotoxicity Associated With Exposure to Chemicals
61. Chromium
62. 1,2-Dichloroethane
63. Organophosphorus Insecticides: A General Introduction

The prices range from CHF 6.– to CHF 28.–. They are available from national WHO sales agents or in case of difficulty from WHO, Distribution and Sales, 1211 Geneva 27, Switzerland.

The rational use of drugs

This volume summarizes the numerous complex issues identified and discussed during an international conference on the rational use of drugs. The meeting represented an unprecedented gathering of more than 100 experts from national and international regulatory authorities, ministries of health, the pharmaceutical industry, consumer-protection groups, and academic research. Virtually all issues related to policies, information, and rational practices in the manufacturing, marketing distribution, prescribing quality control, and regulation of pharmaceuticals were discussed in their full complexity.

The book opens with a succinct overview of points debated during the meeting, including the extent of agreement or disagreement surrounding each. The second part of the book provides a topic-by-topic summary of the widely divergent views expressed during the five-day meeting. Points of discussion range from ways of improving information to prescribers and consumers, through various mechanisms for assuring that ethical criteria for advertising are observed, to the difficult question of whether the high price of certain drugs can be attributed to the costs of research and development.

The most extensive part of the book reproduces 17 working papers prepared for the conference and designed to clarify ways of making drug use more rational. Topics include the responsibilities of governments, prescribers and dispensers; possible ways of rendering drug information more objective and more accessible to prescribers and consumers; suggestions for improving drug marketing and for making prescription practices more rational; and proposals for improving distribution schemes. National case studies from six developing and developed countries are used to illustrate some of the ways these suggestions can be put into practice.

As a unique record of the views and interests of all parties concerned in the world drug situation, the book will serve as a key source of guidance in the development and planning of actions necessary to ensure that drugs are used more rationally throughout the world.

The Rational Use of Drugs *(report of the Conference of Experts, Nairobi, 25–29 November 1985) is published by the World Health Organization, Geneva, 1987. pp. 329, ISBN 92 4 156104 1. Price: CHF 52.–/USD 31.20. Available in English. Arabic, Chinese, French, Russian and Spanish versions in preparation.*

News & Views

International research on aetiology of the toxic oil syndrome: Call for research proposals

In 1981, the disease that came to be known as the toxic oil syndrome (TOS) struck swiftly and suddenly in Spain. To date, some 20 000 people have been affected, with about 400 deaths.

The Social Security Health Research Fund (FIS) of Spain and the Regional Office for Europe of the World Health Organization announce a coordinated international research programme on the aetiology of TOS.

Research projects will be considered in the following areas:

- Search for anomalous compounds in oils possibly related with the pathogenesis of TOS.
- Animal toxicity studies of TOS.
- Pharmaco/toxico–kinetic studies of proposed aetiological compounds.
- Biochemical studies related to TOS.
- Clinical and *in vitro* studies of immunological abnormalities related to TOS.
- Clinico–epidemiological studies of the long-term evolution of TOS.

To obtain further information on the proposed lines of research and how to apply for a research grant, please write to: Director, Social Security Health Research Fund (FIS), c/Antonio Grilo 10, E-28015 Madrid, Spain, or to: Director, Environmental Health Service, WHO Regional Office for Europe, Scherfigsvej 8, DK-2100 Copenhagen, Denmark.

IUPAC now has FAX

The IUPAC Secretariat now has a facsimile machine. The FAX number is +44 (865) 747510.

Scrolls presented

Prof. Calado (right) receives the 75th Anniversary Scroll on behalf of SPQ from Dr Williams.

Dr Mazar Barnett (left), Director of the Asociación Química Argentina receives the IUPAC scroll from Prof. Arvia.

At the Bureau meeting in Boston on 28 August 1987, bureau member Prof. Arvia received a IUPAC scroll on behalf of the Asociación Química Argentina (AQA). The scroll, which was presented by President Rao, congratulated AQA on the occasion of the 75th anniversary of its foundation. The anniversary occurred in July 1987. On his return to Argentina, Prof. Arvia presented the scroll to Dr J. Mazar-Barnett, Director of AQA.

The Sociedade Portuguesa de Química (SPQ) also celebrated the 75th anniversary of its foundation in 1987 — in April. A IUPAC scroll commemorating this occasion was presented at the IUPAC Secretariat to Prof. Jorge C. G. Calado by IUPAC Executive Secretary Dr Maurice Williams. Prof. Calado is reponsible for SPQ international affairs and is also an associate member of the Commission on Thermodynamics (I.2).

World record error

One of the largest errors ever in *CI* has been spotted by Dr W. Val Metanomski, author of the article on "Unusual names assigned to chemical substances" (see *CI*, pp. 211–215. November 1987). Following his article, there is an item entitled "Is this a record?" which contains a box called "A world record" (see p. 216). On the 7th line of this boxed item a zero is missing. The longest scientific name contains 207 000 letters and NOT 20 700 letters as stated – a mere difference of 186 300 letters!

If that isn't enough, Metanomski has found another error on the same page. If you look closely at the structure of "The compound with most elements" you will see **two** boron atoms. Yet the molecular formula has "Br_2" Metanomski has claimed credit for this error. It occurred in the first typewritten transcription of the first draft in December 1985 and has been carried over ever since to every subsequent version and reproduction.

Chemical education workshop in Fiji

A workshop on chemical education, organized by the Chemical Society of the South Pacific was held in Fiji, 14–16 September 1987.

The purpose of the workshop was to facilitate interaction between teachers of senior chemistry and resource personnel focusing on relevant areas concerning chemistry education in the sixth and seventh forms. The workshop aimed to formulate specific plans of action to improve teacher effectiveness and student motivation and interest in chemistry.

Workshop topics included: a general overview of world chemical education, problems in stoichiometry, language difficulties and text readability, computers in chemistry, low-cost equipment, and motivation using field experience in chemistry teaching. Contributors to the workshop included Malcolm Fraser (UK), Charles Fogliani (Australia) and several members of staff from the University of the South Pacific.

Funding for the workshop was provided from a variety of sources including IUPAC and the Third World Academy of Sciences.

New Orleans Presidents Meeting

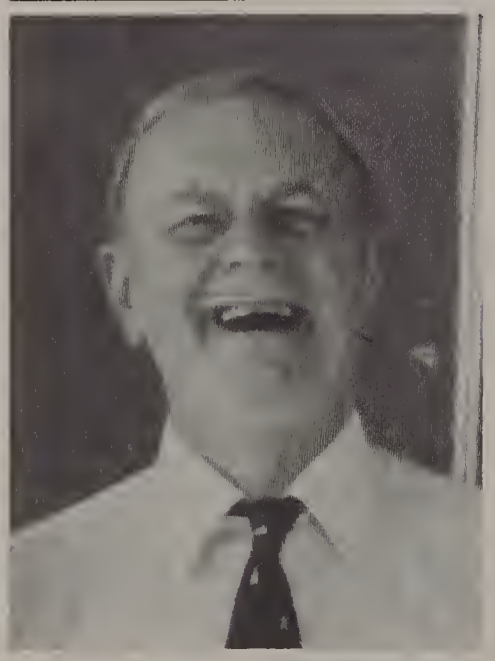
Acad. A. V. Fokin (President, All-Union Chemical Society of D. I. Mendeleev) and IUPAC Secretary General T. S. West (right) at the 11th International Meeting of Chemical Society Presidents in New Orleans (31 August–1 September 1987), which followed on immediately from the Union's general assembly in Boston, USA.

Prof. West delivered a paper on "Improved Cooperation between IUPAC and Chemical Societies", showing how the Union's structure and activities evolved after 1919 from its First World War Predecessor, the International Association of Chemical Societies. The IUPAC Affiliate Membership Scheme, introduced in 1986, was being operated through the national chemical society in several countries.

Acad. Fokin is also Chairman of the National Committee of Soviet Chemists, which is responsible for IUPAC affairs in USSR on behalf of the Academy of Sciences.

Two former presidents of the American Chemical Society at the meeting in New Orleans: Profs. J. C. Bailar, Jr (on the left) and G. T. Seaborg. John Bailar was treasurer of IUPAC during 1963–1971. Attending the deliberations were presidents, heads of staff and representatives from 28 national chemical societies, the European and Asian Federations of chemical societies and IPUAC.

Congratulations



Prof. Keith J. Laidler

Congratulations to Keith Laidler, Professor of Chemistry at the University of Ottawa and Chairman of the Commission on Chemical Kinetics (I.4) for receiving the Henry Marshall Tory Medal. This was awarded to him by the Royal Society of Canada for his pioneering work on the development of transition state theory.

Congratualtion also to Allen Bard, Professor of Chemistry at the University of Texas, USA, who last year, received the 76th American Chemical Society, Chicago Section Willard Gibbs Medal. Bard was cited for his work in electrochemistry. Bard was a member of the Commission I.4 from 1983 to 1987.

To IUPAC with interest

The Biennial Report of the Treasurer published in the November 1987 issue of *CI* showed a table (see page 238) in which the interest for 1986 was given as $1452. The Treasurer has pointed out that this figure should have been $142. Our apologies for the error.

Currency nomenclature

Many IUPAC people may have noted that the IUPAC Secretariat have always used the term US-$, though everyone already knows that IUPAC operates on the basis of the US dollar. However, there are around 20 dollar currencies throughout the world, four of which (Australia, Canada, New Zealand, USA) belong to member countries. There are also several "pounds" and "francs". ISO (International Organization for Standardization) has recognized these and other problems and made international codes for the representation of currencies (ISO 4217).

Since nomenclature and symbols are a main topic within IUPAC and we expect people to follow our recommendations, I have decided, supported by the Secretariat, that the ISO codes shall be used officially by IUPAC. We cannot set a particular date for the implementation of the ISO rules. The decision is taken and the ISO codes should be used wherever possible.

A list of ISO codes for IUPAC Member and Observer Countries is given in the table opposite.

Anders Björkman
Treasurer

ISO International Currency Codes

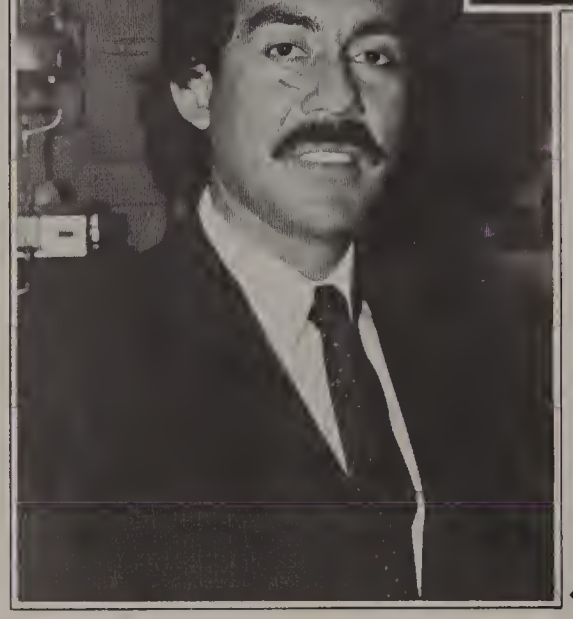
Country	Currency	Code
Arab Republic of Egypt	Egyptian Pound	EGP
Argentina	Austral	ARA
Australia	Australian Dollar	AUD
Austria	Schilling	ATS
Belgium	Belgian Franc	BEF
Bulgaria	Lev	BGL
Canada	Canadian Dollar	CAD
Chile	Chilean Peso	CLP
China	Yuan Renminbi	CNY
Cuba	Cuban Peso	CUP
Czechoslovakia	Koruna	CSK
Denmark	Danish Krone	DKK
Ethiopia	Ethiopian Birr	ETB
Federal Republic of Germany	Deutsche Mark	DEM
Finland	Markka	FIM
France	French Franc	FRF
German Democratic Republic	Mark der DDR	DDM
Greece	Drachma	GRD
Hungary	Forint	HUF
India	Indian Rupee	INR
Iraq	Iraqi Dinar	IQD
Ireland	Irish Pound	IEP
Israel	Shekel	ILS
Italy	Italian Lira	ITL
Jamaica	Jamaican Dollar	JMD
Japan	Yen	JPY
Kingdom of Saudi Arabia	Saudi Riyal	SAR
Kuwait	Kuwaiti Dinar	KWD
Malawi	Kwacha	MWK
Malaysia	Malaysian Ringgit	MYR
Nepal	Nepalese Rupee	NPR
Netherlands	Netherlands Guilder	NLG
New Zealand	New Zealand Dollar	NZD
Nigeria	Naira	NGN
Norway	Norwegian Krone	NOK
Pakistan	Pakistan Rupee	PKR
Papua New Guinea	Kina	PGK
Peru	Inti	PEI
Philippines	Philippine Peso	PHP
Poland	Zloty	PLZ
Portugal	Portuguese Escudo	PTE
Republic of Korea	Won	KRW
Republic of South Africa	Rand	ZAR
Romania	Leu	ROL
Singapore	Singapore Dollar	SGD
Spain	Spanish Peseta	ESP
Sri Lanka	Sri Lanka Rupee	LKR
Sweden	Swedish Krona	SEK
Switzerland	Swiss Franc	CHF
Thailand	Baht	THB
Turkey	Turkish Lira	TRL
USSR	Rouble	SUR
United Kingdom	Pound Sterling	GBP
USA	US Dollar	USD
Yugoslavia	New Yugoslavian Dinar	YUD

Latin American affiliates at Surrey University

▲ Angela Danil de Namor.

◀ Heloína Berroa de Ponce.

▲ Zunilda Giménez.



◀ Franz Fernández Salazar.

Dr Angela Danil de Namor from Argentina is a lecturer at the Department of Chemistry, Surrey University, UK. She is also Assistant Dean for Academic Links with Latin American Universities. Dr Danil de Namor is an associate member of the Commission on Solubility Data (V.8) and Co-Chairman of the 3rd International Symposium on Solubility Phenomena to be held at Surrey University, 23–26 August 1988. She has recruited a number of IUPAC affiliates from Peru.

Franz Fernández Salazar and Helóina Berroa de Ponce are both PhD students at Surrey University and both graduated at the University of St. Agustin, Arequipa, Peru. Zunilda Giménez is working for an MSc in Toxicology in the Department of Toxicology at Surrey University. Her home is in Asunción, Paraguay. All three are IUPAC affiliates.

We regret to record the death of:

Prof. J. Bénard, France (4 October 1987) — President of IUPAC (1971–73), Committee on Teaching of Chemistry (1964–72), President of Inorganic Chemistry Division (1967–69), Commission on Nomenclature of Inorganic Chemistry (1949–69).

Prof. Bénard at the Lyon General Assembly.

Dr K. Bláha, Czechoslovakia (28 August 1987) — Commission on Nomenclature of Organic Chemistry (1969–87), Publications Committee (1974–79).

Dr Blaha.

Address changes

Dr Joyce L. Beare-Rogers (Chairman, Commission on Oils, Fats and Derivatives): Banting Research Centre, Bureau of Nutritional Sciences, Tunney's Pasture, Ottawa, Ontario K1A 0L2, Canada. Tel: +1 (613) 957 0919. Telex: 053-3679 HWC HPB OTT. Fax: +1 (613) 957 1905.

Mr W. D. Pocklington (Secretary, Commission on Oils, Fats and Derivatives): Telex: 8813148 DIHO G. Fax: +44 (1) 928 2655.

Dr Rita Cornelis (Secretary, Commission on Toxicology): Instituut voor Nucleaire Wetenschappen, Rijksuniversiteit-Gent, Proeftuinstraat 86, B-9000 Gent, Belgium. Tel: +32 (91) 228721. Telex: 12.754 RUGENT B.

Letter to the Editor

Water chemistry

Sir,

It was very interesting to read Alan Tetlow's account of the Water Chemistry Workshop held in October, 1986, in Frankfurt, FRG (see *CI*, page 179, September 1987).

However, on reading the proceedings of the commission's meeting entitled "Removal of Chlorinated Hydrocarbons and Heavy Metals from Wastewaters by Advanced Treatment Systems", I noted that the commission also considered (on the last page of the proceedings) whether IUPAC should produce a "priority pollutant" list on an international basis. I would totally support the latter and would suggest that IUPAC proceeded with this significant task without delay and with the cooperation of other international agencies such as IPSC (International Programme on Chemical Safety).

As a number of world experts will be gathering at Guildford, UK on 11–14 July 1988, for the 3rd FECS (Federation of European Chemical Societies) Conference on Chemistry and the Environment entitled "Risk Assessment of Chemicals in the Environment" which is being organized by the Royal Society of Chemistry, it is suggested that a satellite meeting might be organized by IUPAC on 15 July 1988, to fully discuss how such a list should be compiled.

Suggestions are welcome. They should be sent to Mervyn Richardson, 6 Birch Drive, Maple Cross, Rickmansworth, Herts WD3 2UL, UK.

Mervyn Richardson
Affiliate Member

Teaching chemistry in Tanzania

Philippa Hulme

IUPAC affiliate Philippa Hulme teaches chemistry at Pugu Secondary School, near Dar es Salaam. In this article she outlines the education system in Tanzania and describes how chemistry is taught in Tanzanian secondary schools.

I was born in Hull, England in 1964 and went to school in Bath. In 1985, I graduated with an honours degree in "Chemistry Resources and the Environment" from the University of York. The following year I studied for the Postgraduate Certificate of Education at the University of Oxford, Department of Educational Studies.

I then applied to Voluntary Service Overseas (VSO) for chemistry teaching posts in secondary schools abroad. VSO is a British organization which aims to work with the peoples of the Third World for economic and social justice. In order to achieve this aim, VSO acts as a link between people with useful skills and countries seeking their assistance. I was offered a job in Tanzania.

Philippa Hulme: Enjoyable and rewarding work in Tanzania.

Education for self-reliance

The educational system of Tanzania is based on a paper entitled "Education for Self-Reliance" which was issued by former-President Nyerere in 1967. All children are entitled to attend primary school for seven years; 98% take up their places. At these schools, pupils study a wide variety of subjects, including science.

Two percent of primary school leavers are selected to enter government secondary schools, and a similar number go to private schools. Most students remain at secondary school for four years, but a small proportion continue their studies to a more advanced level.

Pugu Secondary School

I teach chemistry at Pugu Secondary School, which is a boys' boarding school near Dar es Salaam. The school has 800 students aged 14 to 24 and about 40 teachers.

All students are required to contribute towards the running of the school by fetching water, cleaning, and working on the school "shamba" (farm).

All students are required to contribute towards the running of the school by fetching water, cleaning, and working on the school "shamba" (farm). The money which is earned by selling the produce of the shamba — mainly bananas and coconuts — helps to pay for the students' food.

Half the students are in forms one to four, where they study a range of subjects, including chemistry, physics, biology, agricultural science, mathematics and political education. Those who pass the form four National Examinations receive the School Certificate.

In forms five and six, there are 400 students from all over the country of whom three hundred are studying for the Advanced Certificate of Secondary Education Examination in Chemistry. I teach 70 of these students in two classes.

Relevance of chemistry to everyday life and development in Tanzania

One of the major objectives of the chemistry syllabus is to help students to appreciate the relevance of chemistry to everyday life, and its potential role towards the development of Tanzania. The content of the syllabus reflects this objective: there are sections on soil chemistry and its relevance to increasing agricultural production, and on water treatment. The chemistry of elements and compounds is related to their importance in local industry. Students also participate in projects which illustrate the applications of chemical knowledge.

Unfortunately, teaching chemistry in Tanzania presents several problems. Owing to a lack of foreign exchange, the supply of chemicals is severely restricted. Hence practical work is limited, and students are unable to prepare adequately for the practical examination. Students spend much time copying notes from the blackboard because only very few textbooks are available. Some students experience difficulty in understanding and expressing themselves in English, which is the medium of instruction in Tanzanian secondary schools.

In spite of these frustrations, I find my work enjoyable and rewarding. As well as the satisfaction gained from helping my students to learn, I myself learn much from their lively discussions and enthusiasm. I feel privileged to work in such a beautiful country amongst exceptionally kind and welcoming people.

The relevance of chemistry to agriculture and industry in Tanzania is stressed in the syllabus. The top photograph shows a machine operator at the sugar factory near Mosai. The plant is undergoing the annual overhaul, before the beginning of the harvest season at the end of August. In the centre, coffee — which is an important crop in Tanzania — is being picked on a plantation near Moshi. In the bottom photograph, recycled paper is being used in a factory in Dar es Salaam. (*Photos courtesy UNESCO*).

Clinical chemists convert to the mole

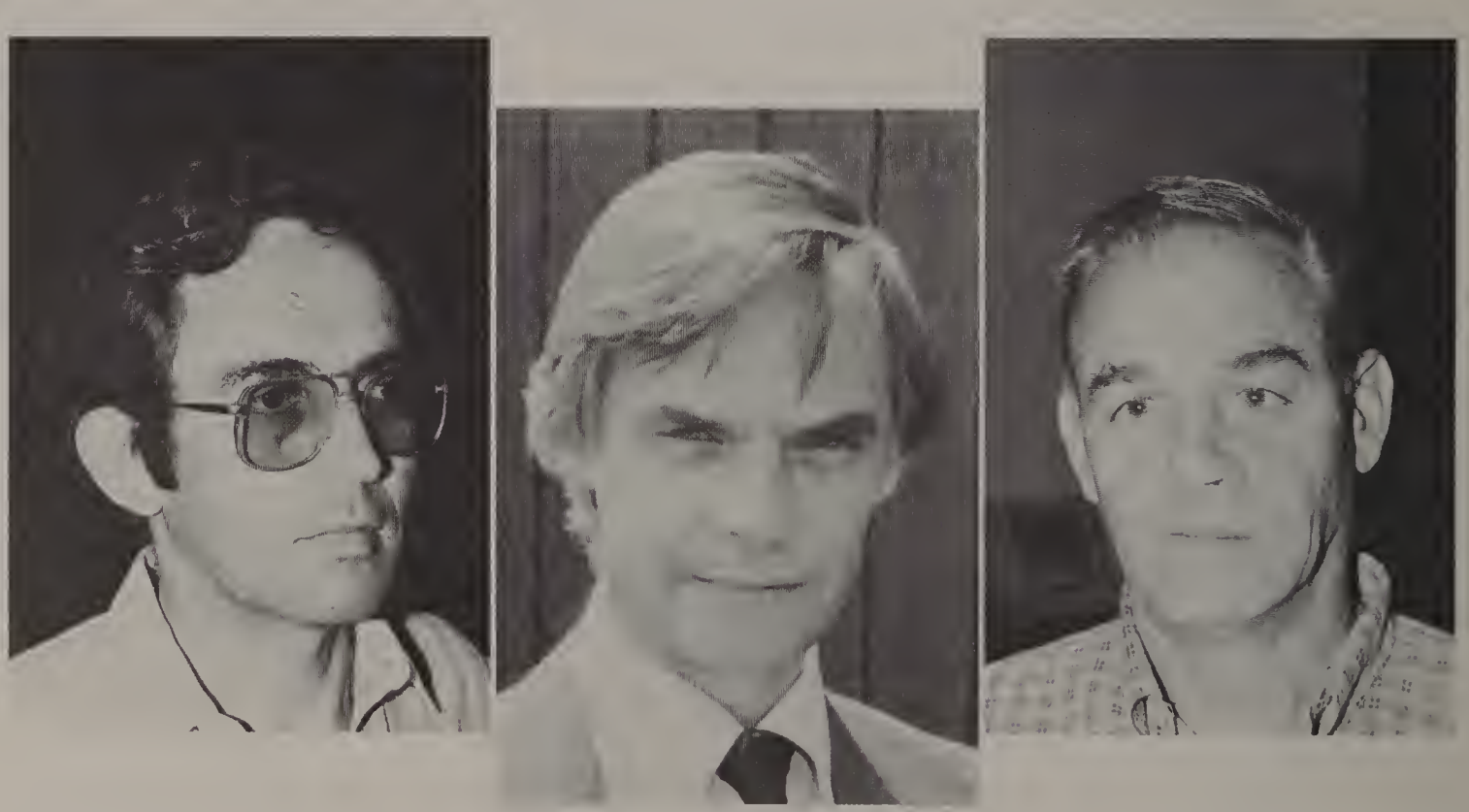
Peter Lehmann, Howard Worth and Oren Zinder

Controversy continues in many countries concerning the use in clinical chemistry of mass units instead of recommended moleculars units. This article reiterates IUPAC and IFCC recommendations, presents some data on conversion factors and offers guidance on conversion procedures.

Introduction

Debate on the use of SI units in clinical chemistry has continued for many years. Despite the recommendations made by IUPAC and the International Federation of Clinical Chemistry (IFCC) in 1967[1] and 1979[2], and the World Health Organization (WHO) in 1977[3], the controversy continues and many countries still use mass units instead of the recommended molecular units. This situation may change in the near future, however. Australia, Scandinavia and the UK have been largely committed to the recommended SI units, with a variable commitment in the remainder of Europe, ranging from virtually 100% in Switzerland to 20% in Italy and 5% in Germany. Canada converted in 1982 and the USA plans to do so in 1988[4]. Manufacture and marketing of equipment and reagents is largely directed at these countries which will make it increasingly difficult for those which have not changed, like most of Latin America and Asia, to communicate on scientific matters relating to their patients.

For these reasons, it is appropriate to reiterate the recommendations made by IUPAC and IFCC[2], to present some data on conversion factors and to offer guidance on procedures for conversion.



The authors

Dr Peter Lehmann (left) is chairman of the Commission on Quantities and Units (VII.2) and a member of the Department of Pathology, Louisiana State University Medical Center, New Orleans, USA. Dr Howard Worth (centre) is secretary of the Commission on Teaching (VII.3) in the Clinical Chemistry Division and a member of the Department of Clinical Chemistry, King's Mill Hospital, Nottinghamshire, UK. Prof. Oren Zinder (right) is chairman of Commission VII.3 and a member of the Department of Clinical Biochemistry, Rambam Medical Center, Haifa, Israel.

Debate on the use of SI units in clinical chemistry has continued for many years.

Système International d'Unités

The Système International d'Unités (SI) was adopted by the General Conference of Weights and Measures in 1960 and later accepted in principle by both IUPAC and IFCC. The system defines seven base units which may be used singly or in combinations to describe most quantitative measurements. These units are listed in Table 1.

Table 1. The SI base units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Amount of substance	mole	mol
Temperature	kelvin	K
Electric current	ampere	A
Luminous intensity	candela	cd

In addition, there are derived units which are algebraic expressions of the base units using mathematical operations. A list of derived units in common use in clinical chemistry is given in Table 2. Common usage of certain other units which are not part of SI is recognized, for instance the minute (min), hour (h), day (d), and litre (L). Of particular importance is the litre, which has been agreed as the fundamental unit of volume in clinical chemistry. The designated symbol for the litre is l or L. The upper case L has the advantage that it cannot be confused with the number one in type-

Table 2. Some derived SI units relevant to clinical chemistry

Quantity	Unit	Derivation	Symbol
Energy	joule	$m^2 kg s^{-2}$	J
Force	newton	$m kg s^{-2}$	N
Power	watt	$m^2 kg s^{-3}$	W
Pressure	pascal	$m^{-1} kg s^{-2}$	Pa
Temperature	degree celsius		°C

script, and is now required for many journals. (In the UK it is a British Standards Institution recommendation.) For these reasons, L is used in this article.

In order to cover a wide range of magnitude of measurement, SI includes a set of prefixes to the units that is added to denote an increase or decrease in the order of magnitude of the quality ranging from 10^{18} to 10^{-18} (Table 3). In clinical chemistry changes in orders of magnitude of 10^3, are recommended, although prefixes for 10^{-2}, 10^{-1}, 10 and 10^2 are an accepted part of SI.

Table 3. Prefixes for SI units

Power	Prefix	Symbol
10^{-18}	atto	a
10^{-15}	femto	f
10^{-12}	pico	p
10^{-9}	nano	n
10^{-6}	micro	u
10^{-3}	milli*	m
10^{-2}	centi	c
10^{-1}	deci	d
1		
10	deca	da
10^2	hecto	h
10^3	kilo	k
10^6	mega	M
10^9	giga	G
10^{12}	tera	T
10^{15}	peta	P
10^{18}	exa	E

*In some languages mili is used

Arguments for and against the adoption of the mole

Mass units and units for amount of substance, the kilogram and the mole, are both acceptable within SI. In clinical chemistry use of the mole is preferred wherever possible, the main issues of the debate being:

Arguments for:

1. The mole is scientifically appropriate, as most methods of analysis (spectroscopy, fluorimetry, im-

Problem with therapeutic drug measurements.

munoassay etc.) are based on the measurement of numbers of molecules and not mass.
2. The concentration of a calibration standard is defined unambiguously. It is unaffected by the chemical form of the material used, for example, glucose standards may be prepared from anhydrous glucose or glucose monohydrate. A given volume of a standard solution, having a concentration of 10 mmol/L contains an unambiguous quantity of $C_6H_{12}O_6$ whereas a standard of 1.80 g/L (or 180 mg/dL) contains differing amounts of $C_6H_{12}O_6$ depending on which form of glucose is used in its preparation. This is a particular problem with therapeutic drug measurements where different salts and conjugates of a drug, perhaps with different degrees of hydration, are available and may be suitable both for administration to patients and calibration of analysis.
3. Physiological relationships between substances commonly occur on a mole to mole basis, for example 1 mole of haemoglobin and 1 mole of O_2 yield 1 mole of oxyhaemoglobin. This is particularly important with pharmacological agents where active metabolites may be present, or different metabolites in the same metabolic pathway are being measured, for example lactate and pyruvate. Indeed, the use of molar units may help in understanding the molecular mechanisms of disease processes more easily.
4. At the present time, many different units are used to express the concentration of some analytes (e.g. mmol/L, meq/L, mg/L, mg/dL for plasma calcium), which can lead to misunderstanding and misinterpretation.
5. As more countries adopt the recommended SI units it is going to become more difficult for the remaining countries not to do so. Increasingly manufacturers and journals are going to use these units or require them to be used.
6. There is therefore, a strong argument for uniformity. This is particularly true in the field of therapeutic drug monitoring where, for example up to seven different units have been reported for measuring digoxin[5]. The same problem arises with many hormone assays, such as thyroxine[6].

Arguments against:
1. The change to the mole has not been universally popular with clinicians in those countries where it has already occurred. Some do not see the need for change and are concerned about the risks of clinical misinterpretation as a result.
2. Clinical chemistry laboratories use balances to measure the quantity of materials for standards and calibrants in mass units. Consequently there are risks that solutions may be prepared incorrectly if molar units are used instead.
3. The reference and/or pathological range for some analytes are cumbersome, e.g. urate is expressed to three figures (μmol/L) or three places of decimals (mmol/L), calcium to two places of decimals (mmol/L).
4. Substances which are administered to patients and are subsequently measured in plasma, serum etc., are prescribed in mass units and should therefore be measured in the same units.

Risks that solutions may be prepared incorrectly if molar units are used?

Conclusions
The strongest argument against the use of the mole is the one which suggests that confusion will be caused by the change. This is an argument against change and not SI units *per se*. If there was uniformity, this would be the strongest argument of all, but as there is not, the strongest argument for change is the one towards uniformity, in order to avoid the risk of confusion and misunderstanding that exists at the present time. If the need for uniformity is accepted, then the mole is the most scientifically acceptable unit.

"The strongest argument for change is the one towards uniformity, in order to avoid the risk of confusion and misunderstanding that exists at the present time."

Against this the other points of the argument are insignificant. If some clinical chemists are unable to prepare solutions in molar concentrations correctly, their ability to prepare solutions in mass concentrations must also be questioned. Some measurements are cumbersome in molecular units, but equally, so are some in mass units, for example urine output of calcium, phosphate, creatinine, etc. This will cease to be a problem as molecular units become more familiar. Finally, the inter and intra patient relationship between the drug administered and measured in the patient's fluids is so variable that the need to express these in the same unit has little or no relevance.

A protocol for conversion to the mole

It must be accepted that the conversion, from one set of units to another, may produce problems for both clinicians and laboratory staff, with the risk of misunderstanding and mis-interpretation. The following protocol is suggested in order to avoid, or at least minimize, difficulties in the conversion:

1. The complete programme should be detailed in advance, and must include a timetable with dates indicating when each step has to be completed. National, regional and/or local organizing commit-

Conversion to the mole may produce problems for clinicians and laboratory staff. A protocol for conversion is suggested.

tees should be appointed to coordinate this programme.
2. Sufficient time must be allowed for each stage to ensure that the timetable is maintained, and staff are adequately prepared.
3. An agreed changeover date must be decided at the outset and adhered to. This date should be agreed nationally if possible in order that all laboratories change at the same time. If this is not practicable, then regions or areas such as cities, districts, etc., should aim to change on the same day.
4. The change on the specified day must be absolute. There should not be a "run in" period during which the old and the new systems are used concurrently. LABORATORY STAFF SHOULD NOT OFFER TO CONVERT DATA BACK TO THE OLD UNITS, but should be able to assist in the interpretation of data presented in the new system.

Timetable for conversion programme:
It is not appropriate to specify exactly how much time should be allowed for the total conversion programme as this will vary from country to country. However, time must be allowed to set up national advisory bodies, including a steering committee, as well as the local laboratory programme. It is difficult to see how this can be achieved in less than two years. The laboratory's preparation for conversion must include the following stages:

1. Agreement should be reached at an early stage on which quantities will be changed. This list must be comprehensive so that additional changes at a later date are avoided.
2. Development and implementation of an education and training programme for laboratory staff to ensure that they understand the purpose of the change, and that they are able to make the appropriate conversions, and advise clinical staff.
3. Development and implementation of an education and training programme for other health care personnel. This should include seminars conducted by members of the laboratory staff who can explain the purpose of the change and respond to questions.
4. Charts and/or tables of conversion data must be prepared for all analytes, and be circulated widely to all health care personnel.

It is highly desirable that the national steering committee should produce a document or booklet giving guidance on these points.

Conversion programme should include development and implementation of an education and training programme for laboratory staff.

Conversion data

The list of the more frequently assayed serum or plasma components in Table 4 shows the conversion factors for the commonly used unit(s) to the recommended units. (This is usually a conversion from mass to molar units, but not always). Additional and more comprehensive listings can be found elsewhere[7–9].

This list, and the subsequent discussion, includes all those clinical chemical analyses for which there are WHO recommended methods (10).

Proteins
Specific protein concentrations should be expressed in molar units where the relative molecular mass is known. This may also be preferred for albumin when its concentration is being compared with other specific proteins or compounds bound to it such as bilirubin. A relative molecular mass for albumin of 67 000 has been used to derive the conversion factor in the above table. Serum total protein concentration is expressed in g/L as no relative molecular mass can be assigned to a heterogeneous mixture of macromolecules. Albumin concentration may also be expressed in g/L in order to compare its concentration with that of total protein.

Enzymes
The recommended unit for the measurement of catalytic activity of enzymes is the katal (kat)[2] which is defined as the activity that will convert 1 mole of substrate per second under defined conditions. However, in most countries the International Unit (U) is still used, and it is defined as the activity which will convert 1 micro mole of substrate per minute under defined conditions.

Hydrogen ion
Traditionally hydrogen ion measurement has been made in pH units. In the recommended units this would be changed to nmol/L, the relationship between pH

Table 4. Conversion data

Analyte	Old units	Conversion (multiplication) factor (Old → recommended)	Recommended Unit
Albumin*	g/dl	10	g/L
		149	μmol/L
Bicarbonate	meq/L	1	mmol/L
Bilirubin	mg/dL	17.1	μmol/L
Calcium	meq/L	0.5	mmol/L
	mg/dL	0.25	mmol/L
Chloride	meq/L	1	mmol/L
Cholesterol	mg/dL	0.0259	mmol/L
Cortisol	μg/dL	27.6	nmol/L
Creatinine	mg/dL	88.4	μmol/L
Digoxin	ng/mL, μg/L	1.28	nmol/L
	μg/dL	12.8	nmol/L
Glucose	mg/dL	0.0555	mmol/L
Iron	μg/dL	0.179	μmol/L
Lithium	meq/L	1	mmol/L
Magnesium	meq/L	0.5	mmol/L
	mg/dL	0.411	mmol/L
Paracetamol (Acetaminophen)	mg/L	0.00661	mmol/L
	mg/dL	0.0661	mmol/L
Phosphate	mg/dL	0.323 (as phosphorus)	mmol/L
Potassium	meq/L	1	mmol/L
Salicylate	mg/L	0.00724 (as salicylic acid)	mmol/L
	mg/dL	0.0724 (as salicylic acid)	mmol/L
Sodium	meq/L	1	mmol/L
Thyroxine	μg/dL	12.9	nmol/L
Total protein	g/dL	10	g/L
Triglyceride	mg/dL	0.0124 (as tripalmitin)	mmol/L
	mg/dL	0.0113 (as triolein)	mmol/L
Urate	mg/dL	59.5 (as uric acid)	μmol/L
		0.0594 (as uric acid)	mmol/L
Urea (Carbamide)	mg/dL	0.167	mmol/L
	mg/dL	0.357 (as blood urea nitrogen)	mmol/L

*See below why two recommended units are given for albumin.

and hydrogen concentration being

$pH = -\log_{10}[H^+]$ where $(H^+]$ is expressed in mol/L.

A pathological blood pH range of 7.8 to 6.8 corresponds to a hydrogen ion concentration range of 16 to 160 nmol/L. The use of molecular units clearly demonstrates the wide range *in vivo*; this being greater than most of the commonly measured analytes in whole blood, plasma or serum. However, the pH scale, which is consistent with the SI, will continue to be widely used.

Partial pressure of gases

It is recommended that whole blood partial pressure measurements (i.e. pO_2 and pCO_2) should be reported in kilopascals (kPa) rather than millimetres of mercury (mHg).

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Acknowledgement

The authors wish to acknowledge the helpful comments and suggestions made by the members of the IFCC Education Committee, the Expert Panel on Quantities and Units, and the IUPAC Commissions VII.2 and VII.3 and many other colleagues.

Secretary General's Column

In this report of the Boston General Assembly, Secretary General Tom West comments on the State of the Union address by Prof. Rao, IUPAC's financial situation, the affiliate membership scheme and a supersonic great Dane.

From 21 to 29 August 1987, about 700 chemists from all over the world came to Boston in USA to attend the working meetings of IUPAC's 7 divisions, 32 commissions, 25 sub-committees, 21 working parties and 10 standing committees. The Bureau, the Council and the Executive Committee of the newly elected bureau also met. Those who came early found Boston in the midst of a heat wave, but by the end of the meeting the New England temperature had returned to its normal pleasant level for late August.

For the past six years it has been my custom as secretary general, and before that as assistant secretary general, to give a brief account of the business transacted on each occasion at the executive, bureau and council meetings, and to convey an overall impression of events at IUPAC's general assembly meeting which occurs every other (odd-numbered) year, and particularly to highlight new departures or initiatives taken by the policy-generating bodies.

The main event of the general assembly is, of course, the scientific debate and discussions of the commissions and divisions which regulate the main thrust of the Union in relation to nomenclature, codification, international agreement on measurements, techniques, data tabulation, automation, interdisciplinary matters within chemistry and between chemistry and other sciences, and so on. It is beyond the scope of this column to discuss those scientific matters. The outlines will appear in division presidents' reports and in the minutes of the various bodies, which are fairly widely distributed and many of which feature or will feature soon in *CI*. The volume of scientific work is enormous and the time and effort put into IUPAC's affairs with selfless devotion by so many individuals, on a purely voluntary basis, is most impressive.

BOSTON

▲ Boston University skyline along the Charles River.

▲ Commonwealth Avenue and Kenmore Square, familiar to all who attended the General Assembly.

▲ Boston University School of Education where many of the meetings took place.

▲ Reception for about 700 chemists from all over the world.

Delegates vote at the Council ▶ meeting.

Division Presidents' Reports will be featured in the next issue of *CI*. This issue will also contain more Commission & Committee News from Boston.

Results of elections

The final issue of *CI* (No. 6, November) for 1987 carried on pp. 225–232 a complete list of the elected officers of the Union and of the divisions, commissions and standing committees. The Union was pleased to have Valentin Koptyug (USSR) installed as its new president at the end of the assembly and to welcome Yves Jeannin (France) as Vice-President/President-Elect for 1987/9. The treasurer, Anders Björkman (Denmark) was re-elected for a second (and final) period of four years, as was the secretary general.

New division presidents are K. I. Zamaraev/USSR (Physical Chemistry), E. Fluck/FRG (Inorganic Chemistry), and Sukh Dev/India (Organic Chemistry), with the existing presidents T. Saegusa/Japan (Macromolecular), G. H. Nancollas/USA (Analytical Chemistry), P. C. Kearney/USA (Applied Chemistry) and S. S. Brown/UK (Clinical Chemistry) continuing for two more years. The newly elected council members are A. R. J. Arvía (Argentina) — re-election, M. T. Beck (Hungary), J. Jortner (Israel), G. Modena (Italy), N. Sheppard (UK), and M. A. Staab (FRG).

The roll-call of division presidents and bureau members is an impressive one and augurs well for the continuing vitality of IUPAC over the next two to four years. Profs. S. Itô (Japan) and N. Sheppard (UK) were elected by the Bureau to the Executive Committee.

State of the Union

In his report on the State of the Union, which was published in the January 1988 issue of *CI*, retiring President 'Ram' Rao (India) expressed his thanks to all who had worked so hard and to such good effect in the commissions and divisions during the two years of his office. He noted with particular appreciation the constant up-dating of the nomenclature and symbols compendia and books and the launch into newer areas for IUPAC such as the environment.

The CHEMRAWN activity received his particular commendation, and not only for its past achievements in relation to the world's needs for raw materials, food, and so on, but also for its up-to-date approach to the 'state of the art' developments in modern science as typified by the most recent (at that time) CHEMRAWN VI conference on Advanced Technological Materials for Innovation in Energy, Transportation and Communications:

> "CHEMRAWN will become a great asset not only to chemists, but to all professionals in science, engineering and technology; even those involved in planning and development should get interested in CHEMRAWN."
>
> ". . . IUPAC is certainly proud of CHEMRAWN."

Other activities which received Prof. Rao's accolade were those of the Committee on the Teaching of Chemistry, the Committee on Chemical Databases, and the considerable number of chemists engaged in IUPAC's activities who had generated so many valuable books in the Union's impressive list of recent publications.

The three new division presidents (from left to right): Profs K. I. Zamaraev, USSR (Physical Chemistry, Division I); E. Fluck, FRG (Inorganic Chemistry, Division II); Sukh Dev, India (Organic Chemistry, Division III).

During the earlier part of the general assembly, the Bureau had a special all-day session, additional to its normal meetings, to discuss whether the present IUPAC divisional structure required modification to meet the changing needs of present-day chemistry and to take the Union through into the final decade of the 20th Century. This was largely a stock-taking exercise, with debate between those who wished to restructure completely and those who were in favour only of slight modification and re-tuning of the present structure. The latter has evolved progressively since IUPAC emerged from its predecessor organization, "The International Association of Chemical Societies".

Because of its preliminary nature and the Bureau's decision to continue discussions in 1988 and at the next general assembly in 1989, President Rao commented only briefly on this vitally important and significant debate and I would refer readers to his State of the Union Address mentioned earlier.

". . . a decision was taken to set up division forward planning groups (think tanks)."

However, a decision was taken to set up Divisional forward planning groups (Think Tanks) in the interim. The Analytical Division initiated such an activity several years ago with excellent results in 'corporate' thinking about the direction of its future activity. It is to be hoped that the other Divisions will, in due course, reap similar rewards.

I should like to highlight, in a condensed form, President Rao's parting message to the Union's chemists and chemists generally:

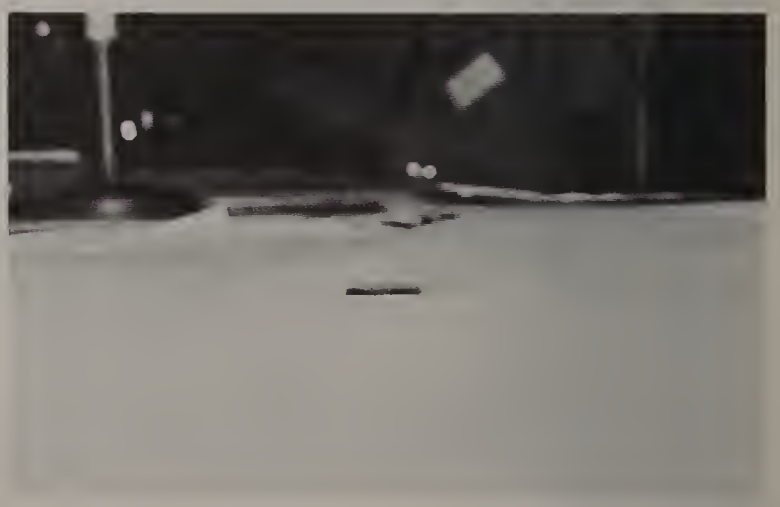
- IUPAC must become more involved in the work of the International Council of Scientific Unions (ICSU). In the past IUPAC has tended to go its own way, but we can no longer afford to ignore ICSU's global programmes.
- IUPAC must involve a wider community of chemists, specially the younger generation. The affiliate programme has been useful in this direction, but the Union depends on how effectively we can involve the best chemists from all over the world.
- In relation to developing countries, chemists in the scientifically advanced countries, and in internationally organized groups such as IUPAC, have a moral obligation to ensure that the developing countries are able to make the right choices for development.

These are wise counsels from IUPAC's now retired president, whose invaluable contributions to the Union during his term of office and previously on bodies such as the Committee on the Teaching of Chemistry, were warmly endorsed by incoming President Valentin Koptyug.

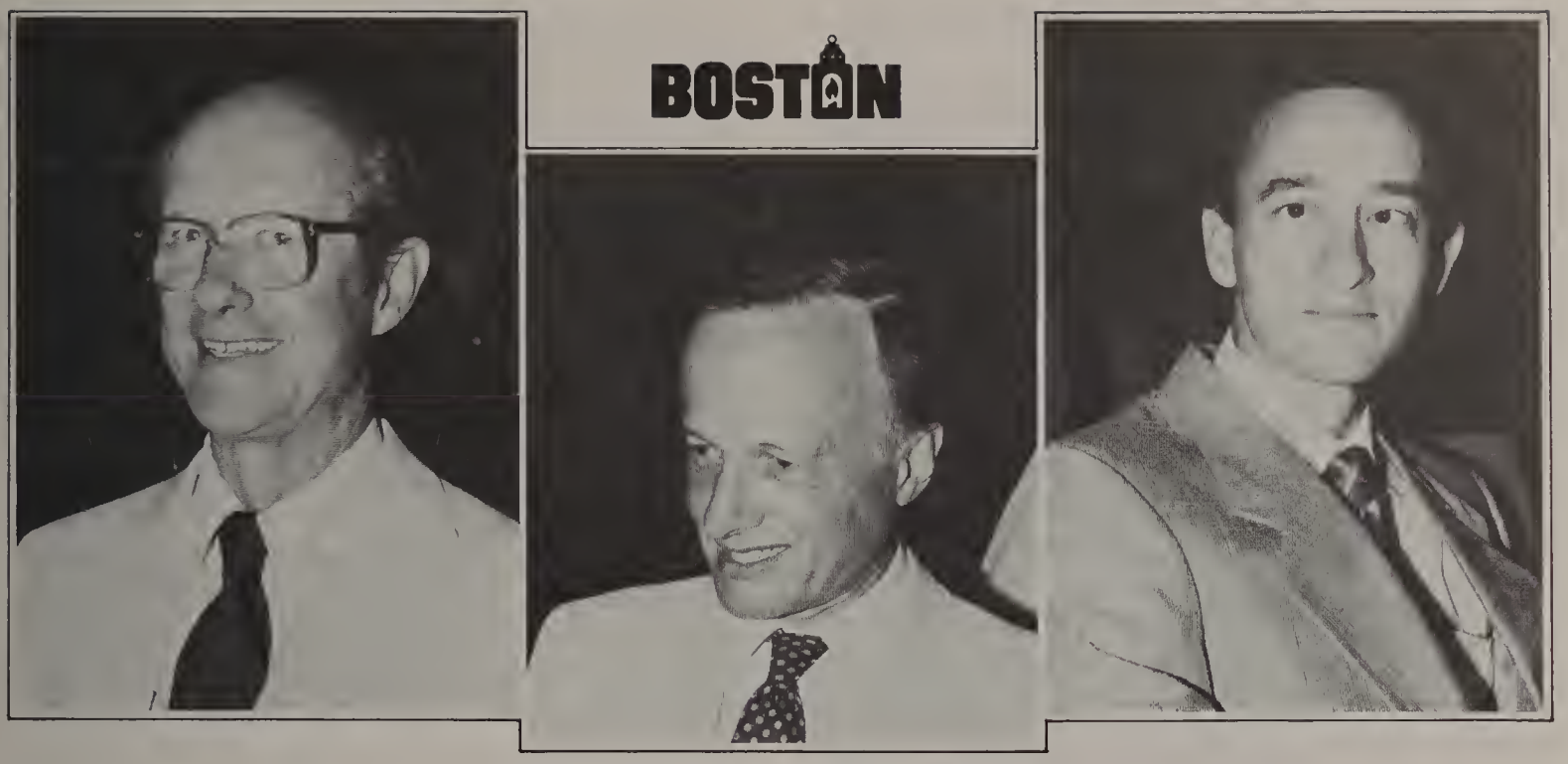
Scientific demonstration at Council meeting

It was, and is, characteristic of Ram Rao that he arranged for a spectacular demonstration of superconductivity on the front bench of the lecture theatre at Boston University at the end of the session where his address was given. I think many delegates willingly missed their coffee break to crowd forward and see what was probably the IUPAC Council's first ever demonstration of practical science during one of its meetings.

A break in the Council meeting as Dr Robert Simon (National Research Council, USA) stretches past a cylinder of liquid nitrogen and uses his pen to point to a superconductor and magnet supplied by AT&T Bell Laboratories. A samarium-cobalt magnet is floating over a ceramic superconductor ($YBa_2Cu_3O_7$) immersed in liquid nitrogen (below).



Another departure stemming from Prof. Rao and the United States "Organizing Committee for the Assembly" under the chairmanship of Prof. 'Bob' Alberty (MIT), was the introduction of two most successful assembly lectures by J. C. Polanyi (University of Toronto) on "New Directions in Reaction Dynamics" and M. S. Wrighton (MIT) on "Chemistry of Microfabricated Structures: New Devices Based on Molecular Materials". Both were well attended and received with great enthusiasm. Many delegates may well hope for the institution of similar lectures on future occasions.



Bob Alberty (left), Chairman of the Assembly Organizing Committee; John Polanyi who shared the 1986 Nobel prize in chemistry and who lectured on reaction dynamics; and Mark Wrighton (right) who lectured on microfabricated structures.

Boston bounce and singing treasurer

Whilst I am commenting on the extracurricular activities at the Boston General Assembly I should also mention the extremely successful evening symposium on "Biotechnology in Chemistry", organized by the Applied Chemistry Division's Commission on Biotechnology (VI.2), and chaired by Division President Phil Kearney. Despite the late Saturday evening "spot" and the full day of commission meetings that preceded it, this was a most successful and rewarding event.

I should also like to take the occasion to express the Union's debt of gratitude to the US Organizing Committee for an outstandingly excellent programme of social events. The visit to the Museum of Science at the Boston Science Park with private showings in the Omnimax Theatre for all division, standing committee and commission delegates and accompanying persons was an outstandingly successful and felicitous event. The enormous space for circulation and the wide range of spectacular exhibits round which delegates could gather, sit and talk or promenade whilst being "fed and watered" in such sumptuous style, was unquestionably in my quite long memory of IUPAC events a very high point indeed, if not even the pinnacle.

The feeding of the 700 at the "Clambake". Copious quantities of lobsters and clams were consumed.

The out-of-door clambake after Prof. Polyani's lecture, which probably constituted the end of their general assembly activities for most commission members, has persuaded me that IUPAC chemists must surely be at the bottom of the Weightwatchers League and could probably win any contest for normal base-line crowd-noise levels.

By contrast, the final banquet for the Council delegates and accompanying persons after Prof. Wrighton's lecture was a more sedate, but superbly catered and programmed event, with Mary Good, President of the American Chemical Society and Chairperson of the US National Committee for IUPAC, adding a very nice touch in making presentations of mementos of the Boston General Assembly to the officers of the Union and to its two long-serving (and sometimes, I fear, long-suffering) senior staff Ann Troughton and Mo Williams of the Oxford Secretariat.

We all expressed our thanks in words but as usual Anders Björkman put us in the shade. Normally he composes some limericks for such events, but on this occasion he gave way after a brief consultation with an apparent tuning fork built into his wrist-watch to a "Cantata for Unaccompanied IUPAC Treasurer". A remarkable feat. As well as being a great Dane, Anders must also have supersonic hearing.

Good financial situation for IUPAC 1985–7

The financial situation of the Union reported on by Fred Wilson, Chairman of the Finance Committee, was in exceptionally good shape. The income from investments increased by 47% in the biennium 1985–7 and the total financial assets overall increased by 45%. Much of this was due to increased income from publications and the investment returns mentioned above plus, of course, the strong US dollar (USD) in the earlier part of the biennium. [The present weakness of the dollar relative to other world currencies must now cause us some concern, however, since all our national subscriptions are collected in that currency. Correspondingly, the Treasurer was able to report an increased allocation of funds to the Divisions and Commissions for their scientific activity, upgrading of the Secretariat's word-processing capacity and other necessary office equipment, and an allocation of USD 10 000 over the next biennium for the enrolment of affiliates (free affiliate membership) in developing countries, thus to match the USD 10 000 given by UNESCO for this purpose in the previous biennium.

Affiliate programme gathers momentum

The Secretary General reported an affiliate membership of over 7500 from some 90 countries at 14 August 1987, as opposed to 5500 from 44 countries in December of the first year (1986).

However, the increased costs of publishing and postage for *CI* and particularly the IUPAC Handbook, which was bigger than the six issues of *CI* in 1986, had led the Executive Committee to recommend with the approval of the Bureau that the IUPAC component of the affiliate membership subscription be raised from USD 7.50 in 1986 and 1987 to USD 12.00. The Council considered this too large an increase and decided that it should be reduced to USD 10.00 for 1988 but gave the officers power to raise it to USD 12.00 if necessary for 1989. Regretfully, the Council noted that it would not be possible for the handbook to be issued free of charge to affiliates in future, but hoped that it could be made available to them at a reduced charge.

I have to note here that in many cases the Council's resolution to reduce the IUPAC component to USD 10.00 came too late because the chemical societies had already drawn up and printed their membership renewal literature for 1988 including the USD 12.00 fee agreed earlier in the year by the Executive Committee. The immediate refunding of USD 2.00 to all those involved would be prohibitive in both cost and staff time, but arrangements will be made with the national chemical societies or academies concerned in due course so that no affiliate is overcharged.

A proposal to set up an Affiliate Affairs Committee within the IUPAC structure to form a more effective channel of communication was not approved by the Bureau. However, the circulation of IUPAC news *via CI* and the affiliate programme throughout 90 countries, as opposed to the former 44 IUPAC countries, and particularly in the developing world, was noted with satisfaction and, as mentioned above, funds were allocated to continue the developing countries' Affiliate membership programme for 1988 and 1989.

The CHEMRAWN (Chemical Research Applied to World Needs) Committee under the leadership of acting Chairman Dr Alan Hayes had useful and productive meetings at Boston, reviewing the aims, objectives and achievements of previous CHEMRAWN conferences and looking forward to those that might be arranged following the temporarily displaced CHEMRAWN IV held in October 1987. A joint meeting of CHEMRAWN and COCI (Committee on Chemical Industry) was held to resolve areas of overlap and common interests. As a result, IUPAC and the scientific community will be able to look forward to new CHEMRAWN conferences, one of which is likely to be a follow-up to the outstandingly successful CHEMRAWN II on a topic related to food sufficiency and also possibly a COCI conference on safety in the chemical industry — a subject which is of considerable interest and concern to the community generally.

The Castle, venue of the Bureau meeting.

CHEMRAWN's outstanding chairman

At this stage I should like to take the opportunity to make public acknowledgement of the tremendous contribution made by Dr Bryant Rossiter, formerly of Eastman Kodak and now of VIRATEK, the first chairman of the CHEMRAWN Committee. Through his unflagging devotion and tireless efforts he made CHEMRAWN what it now is — a visible and tangible expression of the concern of all similarly motivated chemists that chemical research should be used for the good of mankind and as a means of increasing the quality of life, particularly in the less developed parts of the world. The Union owes as

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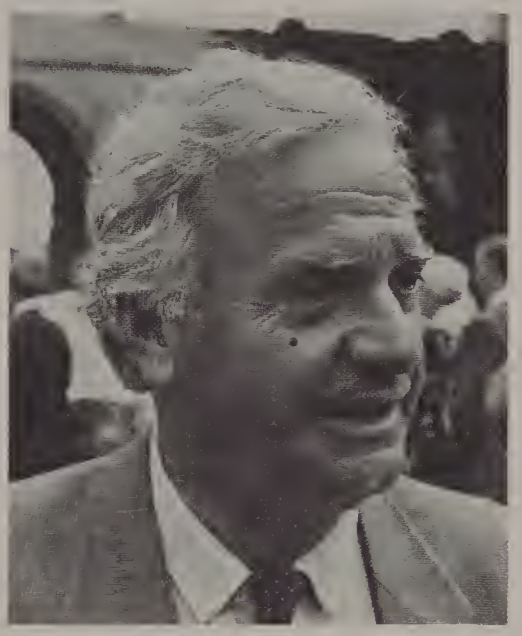
much to him as it does to CHEMRAWN itself. Unfortunately, as dictated by the statutes and bylaws, the end of his term of office as the Chairman of CHEMRAWN fell between general assemblies thus leading to his low-key departure from this most important chairmanship. We are greatly indebted to have enjoyed his skills of leadership and his vitality in IUPAC's affairs. Bryant Rossiter has rendered his Union and chemistry a unique service. I hope that the Union will in turn recognize this collectively and come up to his high standards in so doing.

Sadly, I have to comment here on the irrevocable loss of another great IUPAC chemist and former president — Jacques Bénard (France) who died on 4 October 1987. His gentle and warm, but totally effective, personality was well recognized in IUPAC. He will long be remembered with respect and very considerable affection by all who had the privilege to know him. He always had time for us, no matter how lowly; characteristically he invariably had words of encouragement particularly for the young.

1989 and 1991 General Assemblies and Congress

Lastly, in the space allotted to me by our editor, Mike Freemantle, I should inform all IUPAC's thousands of supportive chemists round the world that the next general assembly will be held in Lund (Sweden), 9–17 August 1989, with the congress in Stockholm during the previous week, 2–7 August. The Council also accepted, in principle, the invitation of the Hungarian Academy of Sciences to hold the 1991 congress in Budapest and the invitation of the Association of Greek Chemists to hold the 1991 general assembly in Athens. These acceptances

Next General Assembly in Lund, Sweden
The 35th IUPAC General Assembly will be held in Lund, Sweden, 9–17 August 1989.



Dr N. Katsaros, who was the Association of Greek Chemists' delegate to Council. The Council accepted the invitation of the Association to hold the 1991 General Assembly in Athens.

are subject to confirmation at the 1989 general assembly. It is hoped that in 1991 the Congress and general assembly can be held in juxtaposition as in Sweden in 1989. Meanwhile, the Executive Committee will meet next in Moscow (16–17 May 1988) and the Bureau in Oxford (18–19 September 1989). I hope to produce reports on both these meetings later this year.

Commission & Committee News

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Resource material in solid state chemistry

At Boston the Committee on Teaching of Chemistry (CTC) concluded that there is a great need to produce resource material in frontier areas for teachers. The presence of associate members from IUPAC divisions at the CTC meeting facilitated this task.

As a beginning, it has been decided to prepare a special issue of the *International Newsletter on Chemical Education* surveying solid state chemistry. The material will be developed by specialists in association with CTC, and will be oriented towards the teaching community. It is envisaged that the special issue will form a basis for a monograph. It is also envisaged that similar action will be initiated in coming years in other areas with the assistance of other IUPAC commissions.

The CTC–UNESCO sponsored Low Cost Equipment Project at the University of Delhi, India, has now led to the formation of several new groups in different parts of the world, for example in France, Brazil and Puerto Rico. To evaluate the different models and to coordinate future work, an evaluation workshop will be held in 1988. Literature in French and Spanish will also be produced to supplement the published manuals in English.

Teacher training workshops in Asia, Africa and Latin America have been planned for the coming year.

Proposals to hold an International Conference on Chemical Education (ICCE) were received from Thailand, Puerto Rico, Canada and the UK. The 10th ICCE will be held in Waterloo, Canada, 20–25 August 1989.

At its meeting CTC decided to collaborate with ICSU–CTS and UNESCO in a post-secondary science teaching project aimed at the least developed countries. CTC will also provide a forum for discussion on the International Chemistry Olympiad at its next meeting and at the next ICCE. Finally, the book *Safety in Chemistry* will be published in collaboration with UNESCO.

The next meeting will be held in Lisbon, Portugal in August 1988.

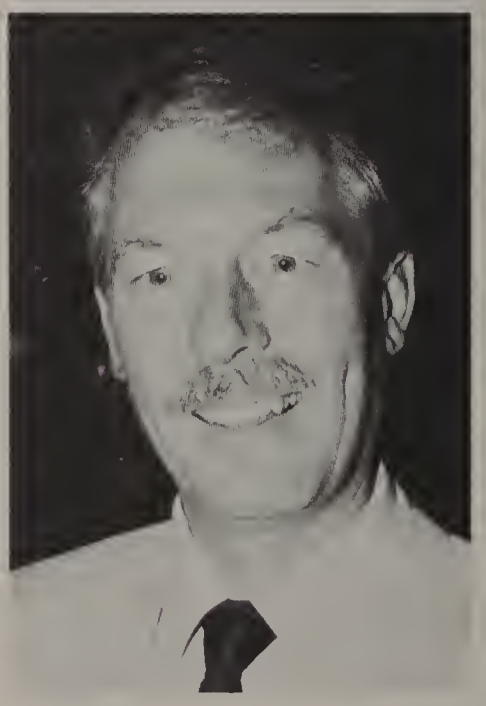
K. V. Sané

CTC Secretary Krishna Sané at the Boston General Assembly: "Don't forget to put the accent on my name," remarked Sané to the editor of *CI*, "otherwise people will think I am sane — which I am definitely not!"

Chemical plant safety

After fruitful discussions with the CHEMRAWN Committee at the Boston General Assembly, the Committee on Chemistry and Industry (COCI) decided to organize a conference in the years 1988/1989 concentrating on the scientific and technological aspects of the problems in chemical plant safety. The conference will be organized in a Western European country, possibly Switzerland. COCI intend to invite specialists from academia and industry as well as from Third World countries. Company Associate experts will participate in the organization of the symposium. Appropriate contacts with chemical trade organizations, such as the Japanese Chemical Manufacturers Organization, will be established. Demonstrations of safety measures will take place at various production facilities.

Research and development in medicinal chemistry is characterized by interdisciplinary effort ranging from therapy and diagnosis to specific questions at the molecular level. This involves experts from a large number of scientific disciplines. COCI proposes to welcome medicinal chemistry within the IUPAC family and expresses the view that the composition of this IUPAC body should reflect commitments in academia and industry. A separate division or section was proposed. In this context remarks were expressed concerning industrial chemistry within IUPAC. More activity in this area would be welcome.



Dieter Wyrsch, Chairman of the Committee on Chemistry and Industry. COCI is to organize a conference on chemical plant safety.

Good progress on spectroscopy data bases

At the Commission on Molecular Structure and Spectroscopy (I.5) meeting in Boston, Dr Jeanette Grasselli introduced a document JCAMP, DX which provided a basis for formatting, retrieval and storage of IR data with IR data banks. The commission agreed that this could form a suitable basis for an IUPAC recommendation. Dr Grasselli agreed to change the format appropriately.

Dr R. N. Jones introduced two documents concerning standardization of the ordinate scale of an IR spectrometer. The commission agreed to his general approach and Jones will proceed to formulate the recommendation.

Dr N. Sheppard presented a document on the formulation of abbreviations in surface spectroscopy which was approved by Commissions I.5 and I.6 to go forward with minor changes. Another

document in surface spectroscopy by Dr D. Bradshaw was approved by Commission I.5; some minor changes are expected from Commission I.6 and the document can then go forward. Commission I.5 members have made considerable input to the document "A Survey of Experimental Techniques in Surface Chemical Physics". Following a joint meeting with Commission I.6 it was agreed to set up a small working party to resolve remaining points.

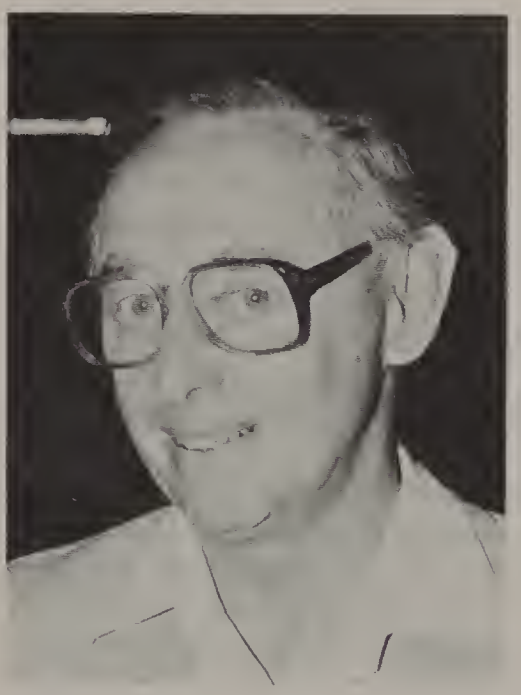
Preliminary documents on referencing and standardization in multinuclear NMR data and the incorporation of NMR data in data banks were approved as the basis for new recommendations.

The force field of benzene would be used as the basis of Part 2 of the recommendation on normal coordinate calculations. There were suggestions for membership of a working party to prepare the recommendation on frequency calibration of Raman spectrometers.

Similarly suggestions were made for the membership of a working party to prepare a document on nomenclature in secondary ion mass spectroscopy (SIMS).

The first draft on "Notations and Conventions in Molecular Spectroscopy Part 3, Permutation Symmetry Notation" was approved by the commission with suggestions for experts to whom it might be sent.

Future projects included the updating of the "Table of Wavenumbers for the Calibration of Infrared Spectrometers" to include a section on high-resolution data. Preparation of a document relating to very high-resolution measurements was approved and preparation of Part 4 of the series "Notations and Conventions in Molecular Spectroscopy" was approved. This will deal with vibrational spectroscopy notation. A recommendation is also to be prepared relating to non-linear Raman spectroscopy.



Norman Sheppard presented a document on the formulation of abbreviations in surface spectroscopy.

H. A. Willis

Revised table of atomic weights

The Commission on Atomic Weights and Isotopic Abundances (II.1) Subcommittee for Isotopic Abundance Measurements has carried out a complete survey of the isotopic abundance data determined by mass spectrometry published over the past two years. Although a number of changes resulted from the analysis, the commission, when it met in Boston, decided not to publish this table in 1987, but to do so in 1989.

The subcommittee also evaluated new experimental techniques for determining atomic weights and noted the new experiment to measure Avogadro's Number using silicon, which will involve an accurate atomic weight determination. A new ion cyclotron resonance technique which has been used to measure the ^{3}H–^{3}He mass doublet was also noted.

An excellent calibrated determination of the atomic weight of gallium enabled the Commission to reduce the uncertainty by a factor of four. The atomic weight of gallium has been changed from 69.723(4) to 69.723(1). This determination will enhance the accuracy of the triple point temperature of gallium. A study of the isotopic composition of gallium in highly purified materials was carried out in conjunction with this study because of the importance of GaAs in the semiconductor industry.

Important new isotopic abundance measurements of boron in a variety of materials has shown evidence of mass fractionation but at this time no change to the atomic weight of boron is necessary, although the situation will be closely monitored, in part because of the importance of boron in the nuclear industry.

The commission considered a detailed report by the Working Party on Non-Terrestrial Materials and decided to include a summary of their extended work in the biennial report. It was noted that a more complete report from this working party had been published independently in 1986 and that the data had proved of great value to the cosmochemical community.

The commission also considered the report of the Working Party on National Isotopic Fractionation and agreed that this group should continue their study of the limitations on atomic weights imposed by natural fractionation processes. A number of theoretical and experimental studies were noted, some of them stimulated by the work of this group. It is planned to complete the analysis within the next two years and publish an evaluated

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set of fractionation data which will have the additional virtue of being of value to geochemists.

The Working Party on Measurements, Sensors and Measuring Instruments, acting on behalf of the division, reported considerable progress in producing succinct and informative materials on uncertainties in chemical measurements for chemistry students and the chemical community. Members of the commission will assist in translating the materials into different languages to enable an evaluation of the documents to be more readily undertaken.

It was also decided to revise and republish the Atomic Weights to Four and Five Significant Figures. The former will be published in the next issue of *CI*, whilst a working party was set up to produce the five figure table by 1989.

The commission is also involved in an interdivisional project "Isotope specific measurements as reference techniques for toxic/essential element assay" through the work of Professor P. de Bieure who gave a verbal report to the commission. Members strongly supported the proposal and pointed out that considerable expertise in measurement science, the production of standards and the use of isotope dilution mass spectrometry, could be found amongst commission members.

The next meeting of the commission will be held in Lund, Sweden in August 1989.

J. R. de Laeter

Pesticide Chemistry Commission to hold meeting and workshop in China

During the meeting on pesticide chemistry held in Boston a major project on "Environmental behaviour of pesticides" was finalized and this will now be prepared for publication. Two other major projects were submitted for publication in 1987, namely "Potential contamination of ground water with pesticides" and "Human metabolism — extrapolation from animal to man".

The ground water project was finalized during the last year and the paper is extremely topical since interest in ground water contamination with traces of organic chemicals, including pesticides, is widespread amongst scientists — industry, regulatory and water authorities. A number of international organizations including the World Health Organisation are appraising the toxicological significance of pesticides in water and our IUPAC paper will serve as useful background.

The "human metabolism" project produced a major report again on a topic of significant interest. It addresses the problems of extrapolating from the metabolic behaviour of pesticides in experimental animals to the situation that will occur when

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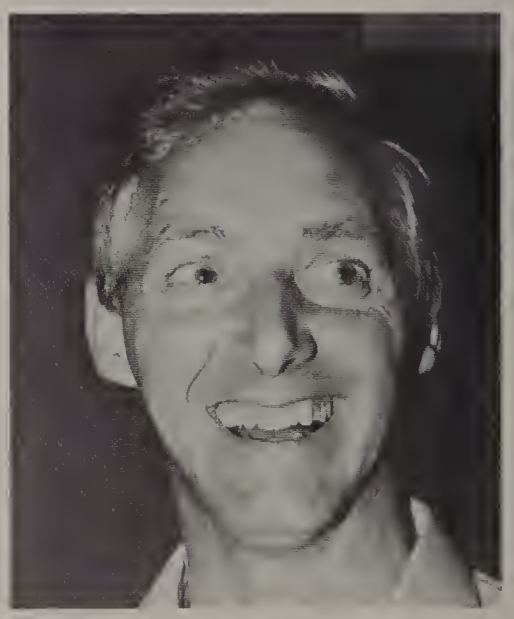
humans are exposed. In view of the interest and the size of the paper it will appear in the form of a monograph and this will be the first that the Pesticide Chemistry Commission has issued.

Last year the 6th International Congress of Pesticide Chemistry was held in Ottawa and this year we learned from Dr Gorbach and Dr Frehse about the planning of the 7th Congress to be held in Hamburg, FRG, 6–10 August, 1990. The organizing committee has set the framework of the programme and already appointed main topic organizers. Commission members were able to discuss the programme and provide inputs to the organizing committee.



Dr Richard Hemingway, the new Chairman of the Pesticide Chemistry Commission, enjoying a joke during a break in the Commission meeting at Boston.

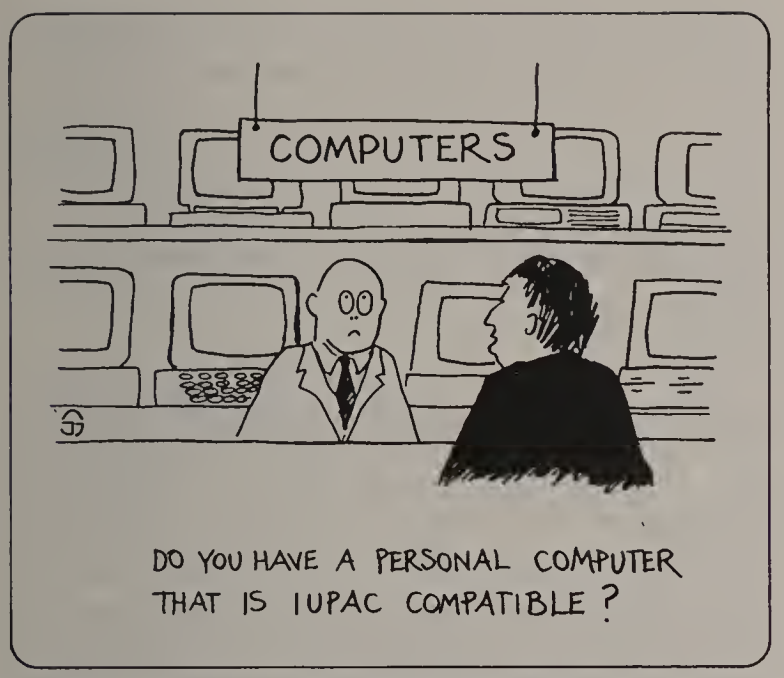
The possibility of holding a Pesticide Chemistry Commission meeting in China has been considered for some time since Professor Zhenming Li invited us to meet there. Plans to hold a commission meeting and a joint IUPAC/Chinese Chemical Society Workshop at Nankai University were finalized and, with IUPAC and industry funding, the meeting will take place in August 1988.

T. R. Roberts

Computer program for automating solubility data input

The "Pilot Project" for solubility data input in computerized format was successfully completed and demonstrated on computer at the Boston meeting of the Commission on Solubility Data (V.8). Further deliberations on the follow up to this activity are designed to improve and enlarge upon this initial step.

Planning for the third symposium on solubility phenomena has progressed and, to date, approxi-



mately 114 paper and poster titles have been proposed. The second circular was due to be issued at the end of 1987.

Six solubility data volumes were projected for publication in 1987. Fourteen new data compilation projects were initiated. They include such topics as "Intermetallics in Mercury" and "Ethene Solubility in All Solvents".

The next meeting of the commission will be held at Surrey University, UK on 21–22 August 1988.

L. H. Gevantman

Macromolecular nomenclature

The Commission on Macromolecular Nomenclature (IV.1) made major progress during the past year and at its recent meeting at the IUPAC general assembly in Boston it completed work on a key report offering about 75 definitions of terms dealing with the very important area of crystalline polymers. This document aims to resolve many of the conflicting usages currently in the literature, and is expected to have a significant impact on scientific communication.

Substantial progress was made on the following:

- Classification of polymerization reactions according to mechanism and stoichiometry, on naming cross-linked polymers, networks and other non-linear polymers (branched and star for example).
- A new system that will permit structure-based naming of irregular polymers such as head-to-head and reacted polymers.
- Conventions for writing structural formulas of polymers.
- The terminology for static and dynamic mechanical properties of polymers in the bulk state.
- A nomenclature for ladder polymers.

A working party was appointed to coordinate the publication of a compendium of nomenclature documents in the polymer field. Revisions will be made on a document on stereochemical terminology, and work initiated on terminology applicable to liquid crystals.

During the past year three reports were completed and submitted for publication in *PAC* one of which, dealing with abbreviations, has already appeared (Vol. 59, No. 5, pp. 691–693, 1987).

The next meeting of the commission will be held on 27–31 July 1988 in Tokyo, Japan.

N. M. Bikales

Isotopic abundances of extra-terrestrial materials

The Working Party on Non-Terrestrial Isotopic Abundance Data (Commission on Atomic Weights and Isotopic Abundances, II.1) has surveyed existing literature in the fields of geochemistry, cosmochemistry, geophysics, planetary science, high energy particle physics and astronomy. The isotopic data were classified in terms of the processes which give rise to isotopic variations and the sources of material from which isotopic variation occur.

The survey now includes the isotopic abundances of elements in stars, planets, satellites, high energy cosmic rays and so-called cosmic dusts. The data indicate considerable variation from terrestrial materials. The results were evaluated element by element, process by process and source by source in order to correlate isotopic abundances of non-terrestrial materials with normal terrestrial materials.

The next meeting will be held in Geel, Belgium, 4 August 1989.

Masako Shima

Polystyrene solubility project progresses

The Liquid–Liquid Subcommittee of the Commission on Solubility Data (V.8) is preparing a volume on the *Solubility of polymers and oligomers of styrene*. This is an expansion of the Subcommittee's previous focus of activity into the area of polymer solubility. Other volumes actively in preparation include *Esters with water*; *Halogenated aliphatic hydrocarbons (C_1–C_6) with water*; and *Amines with water*. A pair of volumes covering the solubility of hydrocarbons (C_5–C_7 and C_8–C_{36}) with water and seawater was recently completed and will soon be published.

The subcommittee will meet again in Guildford, UK, 20–22 August 1988 during the 3rd International Symposium on Solubility Phenomena.

D. G. Shaw

Atmospheric chemistry activities intensify

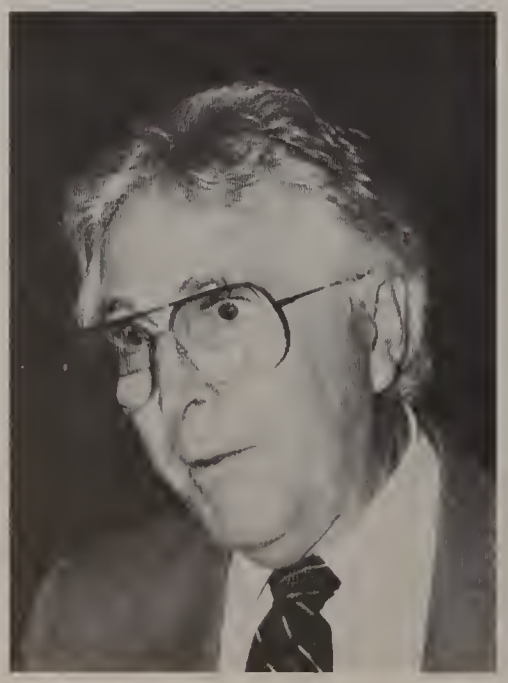
The drafts of two projects, namely *Glossary of Terms in Atmospheric Chemistry* and *Inventory of Tropospheric Sampling Programmes Worldwide* were approved by the Commission of Atmospheric Chemistry (VI.4) when it met in Boston.

The main activity of the commission was the initiation of six projects and three feasibility studies namely:

- Evaluation and harmonization of current tropospheric sampling networks worldwide.
- Review of analytical methods for the measurement of contaminants in the work place.
- Evaluation and recommendation of units for use in atmospheric chemistry.
- Compendium of agencies, institutes and ongoing activities in the field of atmospheric chemistry.
- Major concerns and research needs for our understanding of the chemistry of the atmosphere.
- Evaluation and compilation of Henry's law coefficients as related to atmospheric chemistry.
- The use of passive samples for monitoring of ambient air. Worldwide inventory of emission of regulations. Study to generate an inventory of regulations for emissions and standards on ambient and workplace atmosphere.

The organization of a symposium is envisaged in 1990 devoted to the current recognized environmental problems and related research efforts at national and international levels.

Japanese and USSR delegates are part of the commission which will ensure representation of an important part of the scientific community. The commission seeks additional members from developing countries in view of their possible contribution to newly started projects.



Jack Calvert, Chairman of the Commission on Atmospheric Chemistry. The Commission is seeking additional members from developing countries.

The next meeting of the commission will take place in Munich, FRG, 3–5 September 1988.

J. Slanina

Quantities measured in the clinical laboratory

Several projects were proposed by the Commission on Quantities and Units in Clinical Chemistry at its Boston meeting. They include the preparation of a comprehensive list of quantities in the clinical laboratory specialties of clinical chemistry, hematology/coagulation, microbiology, immunology, allergology and endocrinology. These will greatly expand the 1978 IUPAC recommendation, "List of Quantities in Clinical Chemistry". The aim is to standardize the format for the presentation of quantities in the various clinical disciplines, and prepare a data base that can be incorporated into clinical laboratory and hospital data management and information systems worldwide.

Other new projects include one to recommend a nomenclature for quantities determined semi-quantitatively by solid phase technology. This technology, because of its ruggedness, is being developed to measure an increasing number of analyses for clinical use in non-laboratory settings (for example the home, the hospital bedside, the "field"). A third new project aims to prepare a list of quantities relevant to centrifugation and sedimentation. These are techniques that are widely used in the clinical laboratory.

Current projects were reviewed at the Boston meeting. The document "Quantities and units for metabolic processes as a function of time" was submitted to IDCNS for comment, while the "Glossary of terms on quantities and units in clinical chemistry", that includes approximately 300 items, was approved for preparation for IDCNS review early in 1988. The commission agreed to publish a paper on "Aspects by which assay may be characterized" as a review/background article to its project "Classification quantities and units for binding assays in the clinical laboratory". The same paper forms the basis of a programme proposed by the commission and the International Federation of Clinical Chemistry (IFCC) Committee on Quantities and Units for the 1st Bergmeyer Conference (supported by a donation from Boehringer-Mannheim GmbH to the IFCC) to be held in the Spring of 1988.

On the basis of its publication in *Chemistry International* (pp. 29–33, June 1985) parts of the Commission paper "Nomenclature of Derived Quantities" were approved by Technical Committee 12 (Nomenclature) of the International Standards Organization (ISO/TC-12), for inclusion in revisions of its ISO 31-0 standard (General prin-

ciples concerning quantities, units and standards).

The commission agreed to prepare a recommendation "Nomenclature of Derived Quantities" from its paper for approval as an IUPAC recommendation. The Commission also agreed to prepare a proposal for a special unit name and symbol for the quantity "number (of entities)", or "counts", to be submitted to the Consultative Committee on Units of the Bureau International des Poids et Mesures (CCU/BIPM), supporting a similar proposal being submitted by the International Electrotechnical Commission (IEC).

The next meeting will be held in Wageningen, the Netherlands, in October/November 1988.

H. Peter Lehmann

Publications

The effects of mixtures of chemicals

When chemicals are released to the environment, either indoor or outdoor, they immediately become mixtures with other chemicals or with their own degradation products. Sometimes the chemicals are mixtures before they are released, either in formulations such as an askarel (PCBs (polychlorinated biphenyls) and chlorobenzenes) or by containing manufactured impurities such as dioxin. Industrial and municipal effluents, gaseous or liquid, are usually complex mixtures upon release. Chemicals enter the environment from different sources, at the same or different times or locations, to form mixtures of unlimited numbers which vary in composition and concentration.

This great variety may be classified into three types of mixtures. The first type is created at a given time and place, and has a defined and constant composition. Such mixtures may result from chemical processes or from incineration and are not necessarily composed of compounds having similar chemical structures or properties. For many well-controlled processes the mixtures may have a relatively stable composition over time. Cosmetics and foods containing intentional food additives are examples of mixtures of this type. However, many minor changes in composition may occur which can be important toxicologically. Although large problems may exist, both from the analytical as well as from the toxicological viewpoint, the assessment of this type of mixture can be handled. When the composition of the mixture used in the product varies in time, analysis, especially for toxicological purposes, will be very difficult.

The second type of mixture is composed of compounds with similar physical and chemical properties, such as PCBs or dioxins. Because of differences in distribution and transformation pathways of the individual compounds, or because of variation of release, the composition of the mixture will change with time. Any estimate of exposure, therefore, has to be specified with regard to space and time and should consider not only the chemicals originally present in the mixture but also any products of chemical interactions. Changing the composition of mixtures will result in different exposures of biota with possibly different effects or incidence of effects.

The third type of mixture to which biota can be exposed are coincidental mixtures. These mixtures are composed of compounds that occur by coincidence at the time and place of environmental sampling. No similarity needs to exist between the individual components of the mixture. This coincidental presence may occur frequently or it may result from a single, accidental release.

All types of mixtures create problems for analytical and toxicological evaluation and for monitoring. For example, some of the most acute current problems for human health and environmental welfare are caused by mixtures so intractable that the mechanism of action has not yet been fully explained. Three common examples are photochemical smog, acid rain, and tobacco smoke.

In other, less troublesome mixtures many of the components are not biologically active or are present in low concentrations, and these need not be evaluated. In some instances one or two components of a mixture predominate in toxicity so that the problem of estimating the exposure to, and effects of, the mixture is manageable. For such

All types of mixtures create problems for analytical and toxicological evaluation and for monitoring.

mixtures the initial qualitative or semi-quantitative analyses are especially important to determine the scope of the toxicological assessment that will be required.

Although the difficulties in assessing the effects of mixtures have been recognized, techniques have not been generally available to surmount them. From time to time various approaches to the problem have been proposed. For example, one approach is to determine the composition of the mixture and estimate roughly the total toxicity of the mixture by adding the toxicities of the individual components (multiplying exposure by a coefficient of toxicity).

Some grouping of individual chemicals may be possible to save resources and effort in monitoring and assessment. This leads to a "tier" organization of testing or to a "toxicological fractionation"; both these methods have been used in designing approaches to the assessment of mixtures. Recent advances in analytical and computational technology have made progress easier in some of the difficult areas of the testing and evaluation procedures.

There have been few attempts to define systematically the practicality and limitations of evaluating the biological effects of complex mixtures of chemicals.

SCOPE Report 30, SGOMSEC 3: Methods for Assessing the Effects of Mixtures of Chemicals is based on a Workshop held at the University of Surrey, Guildford, UK, from 15 to 19 August 1983. It was produced under the guidance of the Scientific Group on Methodologies for the Safety Evaluation of Chemicals (SGOMSEC), an international group of scientists concerned with human health and ecological effects. This group examines methods for the evaluation of effects of chemicals, attempts to identify those which are now useful, and suggests procedures for developing new or improving inadequate ones.

SGOMSEC operates under the joint sponsorship of the International Programme on Chemical Safety (IPCS) of the World Health Organization (WHO) in which are represented the International Labour Organization (ILO) and United Nations Environment Programme (UNEP), and the Scientific Committee on Problems of the Environment (SCOPE).

SGOMSEC 3 deals with methods for monitoring the toxicity and transformation of mixtures of chemicals in the environment, for identifying biological indicators of exposure to chemical mixtures and, most importantly, for determining the effects on the metabolic and biochemical processes in biological systems of plant and animal populations and their overall effect on communities and ecosystems. This report indicates how successful discussion on such important issues has already been, and how agreement on research methods and priorities has already been achieved.

The report is edited by V. B. Vouk, G. C. Butler, A. C. Upton, D. V. Parke and S. C. Asher and published by John Wiley & Sons, Chichester, UK, 1987. xxxiii + 894 pp. ISBN 0 471 91123 2. Price GBP 99.00.

Lead, mercury, cadmium and arsenic in the environment

In his address to the sixth general assembly of the Scientific Committee on Problems in the Environment (SCOPE) held in Washington, DC in September 1985, Dr Mostapha K. Tolba, Executive Director of United Nations Environment Programme (UNEP), stated:

> Environmentalists and scientists addressing environmental issues have a duty to demonstrate and to keep demonstrating the advantages that accrue to all nations from environmentally sound sustainable development.

Since its initiation in 1974, SCOPE's Project on Biogeochemical Cycles has been addressing important environmental issues. Initially, the activities focused on the cycles of carbon, nitrogen, sulphur and phosphorus separately. However, realizing that these cycles are inexorably tied together in one integrated system of cycles comprising many mechanisms of mutual interaction, a study of these interactions was started and has proved to be both interesting and fruitful. In 1982, the fifth general assembly of SCOPE recommended that a scientific advisory committee be appointed to provide for intercommunication between the various biochemical cycling projects. Shortly thereafter, the Executive Committee endorsed a project on Global and Regional Cycling of Toxic Metals. This was in response to the need to understand better the pathways and cycles of potentially toxic elements such as arsenic, cadmium, lead and mercury in the environment. Prof. T. C. Hutchinson chaired the Subcommittee on Metal Cycling which organized the first SCOPE Metal Cycling Workshop, held in Toronto in September 1984. The workshop concentrated on four significant environmental pollutants — arsenic, cadmium, lead and mercury — and found major gaps in our understanding of global and regional fluxes in all four elements. In particular, the scarcity of data from developing countries was noted despite the fact that all four elements have been recognized as significant environmental pollutants for at least two decades.

Scope Report 31: Lead, Mercury, Cadmium and Arsenic in the Environment was prepared from the draft contributions prepared for and critically discussed at the Toronto workshop. The book describes the extent of worldwide contamination by arsenic, cadmium, lead and mercury. It provides

details on the pathways and rates at which these four elements cycle in the air, in soils, through crops and native ecosystems and in rivers, lakes and oceans. New contributions are made on oceanic and atmospheric occurrences and on areas of long residence times (sinks) such as lake sediments, deep oceans and forest humus layers. It discusses the sources of these four elements and estimates the relative contribution to global and regional cycling of natural versus man-made sources. The need for a fuller understanding of sources to human populations and to particular high-risk groups is emphasized: for example, the exposure of young children to lead and of elderly females to cadmium in certain areas of Europe. Food sources to humans are discussed with emphasis upon aquatic-based food chains, including fish and shellfish.

The particular problems of developing countries are considered and contrasted with those of the industrialized world. The recurring problems of mercury-coated grains and uncontrolled pollution from smelters and mining operations are set against the insidious problems of long-distance regional distribution of metals via polluted air masses. The book does not simply look at what we already know, but identifies what we need to know in order to build regional and global models of cycles of toxic elements with confidence.

The report is edited by T. C. Hutchinson and K. M. Meena and published by John Wiley & Sons, Chichester, UK, 1987. xxiii + 360 pp. ISBN 0 471 91126 7. Price GBP 48.95.

Third Edition of collaborative study guidelines

A third edition of *Guidelines for the Development of Standard Methods by Collaborative Study* has now been published. The Appendix of this new edition includes selected "Recommendations for Harmonization of Collaborative Study Protocols" as drafted by the ISO/IUPAC/AOAC Harmonization Committee (see *CI*, p. 210, November 1987) and an outline of the application of the Grubbs outlier tests.

A supplement, specially prepared for the third edition, covers the documentation involved in the development of a standard method of collaborative study.

Further details are available from: W. Dennis Pocklington, Laboratory of the Government Chemist, Cornwall House, Waterloo Road, London SE1 8XY, UK.

Improving the scientific literacy of America's youth

The 1985 report *Opportunities in Chemistry* has been revised by its authors, George Pimentel and Janice Coonrod. The new publication *Opportunities in Chemistry: Today and Tomorrow* (National Academy Press, Washington, DC, USA, 1987) is part of an experiment being carried out by the National Academy of Sciences/National Research Council (NAS/NRC) to improve the scientific literacy of America's youth and attract more of its brightest youngsters to careers in science.

The revision makes material from the original survey of modern chemistry more widely available and accessible. The content has been reorganized, the technical vocabulary adjusted and explanatory material and supplementary reading suggestions have been added. The new version provides resource material and supplementary reading for high school advanced placement chemistry courses.

For information on the availability of the publication contact: Ops in Chem: Today and Tomorrow, Lawrence Hall of Science, University of California, Berkeley, California 94720, USA. Tel: + 1 (415) 642–1016.

PAC Review

In this section we take a brief look at the symposia and lectures published in recent issues of *PAC. Pure and Applied Chemistry* (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*.

Organic superconductors

Many aspects of organic solid state chemistry and physics have been developed since the discovery of tetrathiafulvalene (TTF) by Wudl. Among them

are molecular conductors including organic metals and organic superconductors.

Organic metals such as TTF·TCNQ are low-dimensional in nature due to electrical conduction along the face-to-face stacking columns. They inevitably sustain metal-insulator instabilities at low temperatures. If these instabilities were suppressed somehow, one might have a chance of obtaining organic superconductors. One such method of suppression is a chemical modification to increase the dimensionality of molecular conductors.

Chalcogen atoms have been known to form intermolecular chalcogen–chalcogen atomic contacts, and hence, in order to increase the dimensionality of charge transfer (CT) complexes, replacement of sulfur atoms of TTF with other chalcogen atoms with bigger van der Waals (vdW) radius is effective. These intermolecular chalcogen–chalcogen atomic contacts may enable electrons to transport not only along the face-to-face stacking columns but also perpendicular to the columns.

This idea was successfully adopted in the first organic superconductor $(TMTSF)_2PF_6$ by Bechgaard and Jerome *et al*. This material is quasi two-dimensional due to the intercolumn Se..Se contacts. The extension of the idea was to use tellurium atoms with vdW radius (2.06 Å) 14% and 8% greater than those of sulfur (1.80 Å) and selenium (1.90 Å), respectively. But heavy molecules lower the superconducting critical temperature T_c if the superconduction is BCS type. The lattice motion produces the attractive forces for Cooper pairs since $T_c \sim 1/(\text{molecular weight})^{1/2}$.

An alternative idea was to prepare CT complexes with sufficiently high dimensionality by employing molecules which contain lighter atoms than selenium. Saito found that a complex of BEDT–TTF, which has an extended skeleton of TTF with four sulfur atoms, can provide two-dimensionality to suppress the metal-insulator transitions. Extension of the work on the complexes of this capped alkylthio substituted TTF revealed several superconductors.

An overview of a series of tetrachalcogenafulvalene derivatives and their charge transfer complexes was presented by Gunzi Saito (University of Tokyo, Japan) in a session lecture at the 1st International Conference on Heteroatom Chemistry held at Kobe, Japan, 19–24 July 1987. Saito discussed the molecular design of single-component molecular conductors (molecular fastener and chalcogen–chalcogen chain compounds), two-dimensional organic methods, organic superconductors and LB films.

The conference plenary and session lectures were published in the August 1987 issue of *PAC* (Vol. 59, No. 8).

Computer simulation of carbohydrate intricacies

Experimental techniques are now available which can probe the intricacies of carbohydrate structures, equilibria and dynamics. The development of theoretical tools has not kept pace with this progress; the reliance on hard sphere models and orientational averaging is unlikely to reveal the true nature of the phenomena involved.

Computer simulation of polyhydroxy (PHC) molecules in solution may, in the hands of experts, provide valuable assistance to the experimenter but is only in the beginning stages. It is becoming clear that several of the "rules" which were postulated in earlier days as governing PHC behaviour will have to be jettisoned. Although solvation interactions of PHCs are weak — they can be no stronger than hydrogen bonds — evidence is accumulating of sugar equilibria and saccharide shapes. This calls into question the undue reliance of crystal structures in investigations of solution behaviour. There are hopeful signs that the long neglect of carbohydrates by physical chemists is now coming to an end.

A review of recent progress in the physical chemistry of small carbohydrates was presented by Felix Franks (Cambridge, UK) at the 8th International Symposium on Solute–Solute–Solvent Interactions, Regensburg, FRG, 9–14 August 1987. Franks emphasized the manner in which solvents can influence the shapes of carbohydrate molecules, the composition of their equilibrium mixtures (anomers and tautomers) and the interactions between PHC molecules.

The symposium plenary and invited lectures were published in the September 1987 issue of *PAC* (Vol. 59, No. 9).

CARS: diagnostics of discharges

Most of the applications of Coherent Anti-Stokes Raman Spectroscopy (CARS) in the area of analytical chemistry have been related to combustion diagnostics. Combustion studies, however, present many severe problems, especially when studying large-scale turbulent reactors: the beams are bent and defocused by the index gradients leading to substantial intensity (hence concentration) measurement errors. Further, it is a fact that the modelling of turbulence remains crude and that the comparison between experiments and results of numerical simulations does not yet permit the most fruitful exchange between spectroscopist and modeller.

Recently, a few measurements of photochemical products have been undertaken, showing the potential for detection of species at low pressure

with the difficult challenge of completing the measurement in precise synchronism with the photolysis pulse. In this area, the exchange between the experimenter and the theorist is far more rewarding. The measurements can be made quantitative.

Yet, in the opinion of Taran at the Office National d'Etudes et de Recherches Aerospatiales (ONERA), France, discharges are an even better field for CARS. Taran presented his views on this topic in a paper describing various types of discharges recently studied at ONERA using CARS. The paper was presented at the 10th International Conference on Raman Spectroscopy, Eugene, USA, 31 August–5 September 1986.

Taran said that the measurement of quantum state populations in discharges is a difficult problem for the plasma physicist. Emission spectroscopy can be used, but it gives information only about excited electronic states, which are usually far less populated than the ground state. The latter will be detected in absorption, but one does not always find a convenient light source for it.

Fluorescence, which is quite sensitive, can also be used. But many of the common species like N_2, O_2, H_2, absorb in the far UV, where laser sources are not very efficient. Furthermore, the discharge populates the very same states which are accessed by the laser pump, so that light is emitted spontaneously at the same wavelength as the fluorescence signal, causing a potentially harmful interference. Thus, very little appears to be known today about ground state molecular species, even in conventional discharges such as the glow discharge.

Surprisingly, very few papers have been published so far on CARS studies of such plasmas, although the initial demonstration of feasibility is quite old. Yet, the application of CARS is here particularly attractive, with its high detection sensitivity, sharp, Doppler-broadened lines, and weak nonresonant background.

Plenary and selected lectures presented at the conference were published in the October 1987 issue of *PAC* (Vol. 59, No. 10).

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

The nomenclature of polyanions (Recommendations 1987)

The chemistry of polyanions is a rapidly growing field due particularly to the interest of some of these compounds. Some species are becoming very large (up to 48 tungsten atoms) and extremely complicated in structure. Many examples of substituted species are known which lead to isomerism. Today the basic compounds are mostly known among specialists through trivial names and the existing rules for naming polyanions (*Red Book*, 1970 edition) were not elaborate enough to handle accurately all the new species described during the last 15 years.

It appeared necessary to provide a new set of rules. The basic idea is to give a number to each central atom, the environment of which is then described by letters associated to that number. The document describes various types of polyanions having what is called the Lindqvist structure, the Anderson structure, the Keggin structure, the Dawson structure, and some others derived from them.

It is hoped that the given examples will provide a procedure to name any other compound derived from any other structure.

It is clear that these compounds are very complicated and therefore have complicated names. The use of shortened names is always possible describing then only the composition but giving less information on the actual detailed structure.

This report was prepared by the Commission on Nomenclature of Inorganic Chemistry (II.2) and published in PAC, *Vol. 59, No. 11, pp. 1529–1548, 1987.*

Reference value standards and primary standards for pH measurements in organic solvents and water + organic solvent mixtures of moderate to high permittivities

Following the recent report on the criteria for standardization of pH measurements in aqueous organic solvent mixtures (*PAC*, Vol. 57, No. 6, pp. 865–876, 1985), the present report concerns the reexamination of reference value standards (pH_{RVS}) and primary standards (pH_S) determined prior to 1985, the aggregation of new standards freshly determined in the light of IUPAC rules and procedures, and the compilation of recommended data. The pH_{RVS} data (the RVS material is the

0.05 m potassium hydrogenphthalate buffer) now available cover the following solvents and/or their mixtures with water: methanol, ethanol, 2-propanol, 1,4-dioxane, acetonitrile, dimethylsulphoxide, and heavy water (D_2O); the various pH_S now available cover methanol, ethanol, dimethylsulphoxide and D_2O.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) and published in PAC, *Vol. 59, No. 11, pp. 1549–1560, 1987.*

Determination of 'hexane' residues in oils: results of a collaborative study and the standardized method

The development, by collaborative study, of a standardized method for the determination of residual "hexane" in extracted oils is described. The procedure involves the desorption of hydrocarbons by heating the oil in a closed vial. The hydrocarbons content of the headspace is then determined by gas–liquid chromatography using a packed or capillary column and expressed in terms of hexane content. The determination of residual hexane by direct injection of oil into a pre-column was also studied, but was found to be less suitable for routine analysis.

This report was prepared by the Commission on Oils, Fats and Derivatives (VI.3) and published in PAC, *Vol. 59, No. 11, pp. 1561–1570, 1987.*

Clinical chemistry guidelines and recommendations

The following clinical chemistry guidelines and recommendations were published in *J. Clin. Chem. Clin. Biochem.*, Vol. 25, Nos 5 and 6, 1987:

- Guidelines (1987) for Classification, Calculation and Validation of Conversion Rates in Clinical Chemistry (No. 5, pp. 315–325)
- Approved Recommendation (1985) on Names, Symbols, Definitions and Units of Quantities in Optical Spectroscopy (No. 5, pp. 327–336; also published in *PAC*, Vol. 57, No. 1, pp. 105–120, 1985)
- Approved Recommendation (1986) on the Theory of Reference Values. Part 1. The Concept of Reference Values (No. 5, pp. 337–342)
- Approved Recommendation (1984) on Physico–Chemical Quantities and Units in Clinical Chemistry with Special Emphasis on Activities and Activity Coefficients (No. 6, pp. 367–391; also published in *PAC*, Vol. 56, No.5, pp. 567–594, 1984)

Characterization of Si_3N_4 powders

High technology ceramics based on Si_3N_4 are manufactured by sintering high pure and fine grained Si_3N_4 powders at high temperatures and pressures. Chemical composition, phase distribution and physical properties of the Si_3N_4 powder particles are characterized in respect to their sintering behaviour which determines the microstructure as well as the bulk properties of the sintered materials. Impurities, α/β ratio and crystallinity, size, shape and microstructure of primary and secondary particles are analysed.

This report was prepared by the Commission on High Temperature and Solid State Chemistry (II.3) and published in PAC, *Vol. 59, No. 12, pp. 1673–1680, 1987.*

Metal buffers in chemical analysis: Part I — Theoretical considerations

A theoretical treatment of metal buffers in single and two phase systems is given. Equations are derived for the relationship between the pM-value on one hand, and the stability products of the complexes formed between the metal ions and the complexing ligands, as well as the pH of the solutions on the other hand. Examples are given for the use of the equations. Relevant data are given in tabulated form to aid potential users in the choice of suitable metal buffer systems.

This report was prepared by the Commission of Analytical Reactions and Reagents (V.1) and published in PAC, *Vol. 59, No. 12, pp. 1681–1692, 1987.*

Autoprotolysis constants in non-aqueous solvents and aqueous organic solvent mixtures

The recent IUPAC document on standardization of pH measurements in non-aqueous solvents and aqueous–organic solvent mixtures (*PAC*, Vol. 59, No. 6, p. 865, 1985) underlines the importance of the autoprotolysis constant, K_{ap}, which defines the normal range of pH in the relevant solvent. The recommended emf method of determination and the standard states implied by different K_{ap} definitions are duly focused. This compilation is articulated in two Tables the first of which reports K_{ap} data for 100% pure solvents mostly at 298.15 K and the other concerns binary aqueous–organic mixtures of different compositions and at various temperatures.

This report was prepared by the Commission of Electroanalytical Chemistry (V.5) and published in PAC, *Vol. 59, No. 12, pp. 1693–1702, 1987.*

Critical survey of stability constants of cyano complexes

All the published stability constants of cyano-complexes of metal ions, and the acidic dissociation constants of hydrogen cyanide, and those of the protonated metal complexes are critically surveyed. Unfortunately, a great fraction of data is unreliable and only a few thermodynamic data could be classified to the category of recommended values. The reasons for this situation are thoroughly treated, and promising research areas are indicated.

This report was prepared by the Commission of Equilibrium Data (V.6) and published in PAC, *Vol. 59, No. 12, pp. 1703–1720, 1987.*

Recommended procedure for testing the potentiometric apparatus and technique for the pH-metric measurement of metal-complex equilibrium constants

The most widely used technique for the measurement of metal-complex stability constants is based on pH-metric titrations of a ligand in the absence and in the presence of metal ions. Collection and interpretation of experimental data is beset with difficulties and has frequently led to the calculation and publication of erroneous stability constants. This paper presents a recommended procedure for testing both the apparatus and technique, based on the measurement of the stability constants of proton and nickel(II) complexes of glycine. The technique has been extensively and independently tested in nine laboratories, and recommended stability constants and standard deviations are given.

This report was prepared by the Commission on Equilibrium Data (V.6) and published in PAC, *Vol. 59, No. 12, pp. 1721–1728, 1987.*

Recommended method for the gas chromatographic profile analysis of polycyclic aromatic hydrocarbons in smoked food

Results are reported of a collaborative study on the determination of polycyclic aromatic hydrocarbons (PAH) including benz(a)anthracene, chrysene, benzofluoranthenes (b+j+k), benzo(a)pyrene, benzo(e)pyrene, and indeno(1,2,3-cd)pyrene in smoked meat. After calibration of the instrument with a standard solution, four samples of smoked meat (two of each were identical samples, respectively) were analysed. Variation coefficients for the above PAH were found to be 19.5–57.5% with the exception of indeno(1,2,3-cd)pyrene for which a coefficient of 105.5–126.9% was found due to an external impurity which interferes with this PAH in GC.

This report was prepared by the Commission on Food Chemistry (VI.1) and published in PAC, *Vol. 59, No. 12, pp. 1729–1734.*

Recommended method for a thin-layer-chromatographical screening method for the determination of benzo(a)pyrene in smoked food

Results are reported of a collaborative study on the determination of benzo(a)pyrene in smoked meat. To this end four meat samples were analysed for concentrations $<$ or $>$ 0.6 μg benzo(a)pyrene/kg sample.

Polycyclic aromatic hydrocarbons (PAH) are a well known class of environmental carcinogens and in the past benzo(a)pyrene (BaP) often has been used as an indicator for their presence and even as a numerical parameter for the carcinogenic potency of environmental matter, although numerous other PAH also exhibit a comparable biological activity in various systems. This has led to national regulations in some countries. For instance, in FRG a concentration of 1 μg BaP/kg has been set to be the upper limit in smoked meat. Accordingly, a rapid method is required to check smoked food for its benzo(a)pyrene concentration. A method previously described for the determination of BaP, based on thin-layer-chromatographical comparison of BaP of a meat extract with authentic BaP-concentrations, has been optimized and applied in an international exercise by several laboratories.

This report was prepared by the Commission on Food Chemistry (VI.1) and published in PAC, *Vol. 59, No. 12, pp. 1735–1736, 1987.*

Measurement of hemicellulase activities: Part I: Xylanases

The IUPAC Commission on Biotechnology (VI.2) at its meeting held on 20–21 August 1983 at Lyngby, Denmark decided to prepare a document incorporating recommendations on hemicellulase assay procedures and their evaluation. The decision was taken in light of the recently concluded global effort on preparation of a document on "Measurement of Cellulase Activities" which contains recommended cellulase assay procedures and their evaluation under process conditions. The cellulase document

has since been adopted by the Commission and published in the February 1987 issue of *PAC*.

We are aware that hemicellulases have been studied and characterized to a much lesser extent than cellulases. Further, hemicellulases are much more complex as they represent an array of enzymes such as xylanases, mannanases, arabinases (both endo and exo kinds) and their corresponding glycosidases.

The first step taken by us was to compile the information available on assay procedures being followed at various laboratories, which were contacted for this purpose. Those which responded are included in this report. Since most of them reported on xylanase assay procedures in response to our enquiries, we propose to take up this assignment for xylanases only in the first phase. This is in view of the fact that xylanases are the most studied enzymes amongst hemicellulases. Other enzymes such as mannanases etc. may be taken up after completion of the first phase. The Commission may decide on the conduction of standard xylanase assays by those interested to participate on the basis of standard substrates, enzymes and methodologies as had been followed for cellulase assays.

This report was prepared by the Commission on Biotechnology (VI.2) and published in PAC, *Vol. 59, No. 12, pp. 1739–1752, 1987.*

Conferences

Gas kinetics

The 10th International Symposium on Gas Kinetics is to be held in Swansea, UK, 24–29 July 1988. Topics to be highlighted include: theories of reactive processes; molecular reaction dynamics and state-to-state kinetics; elementary reactions of neutral and ionic species; atmospheric and interstellar chemistry and complex and high temperature reactions.

Further information from Drs Roger M. Marshall & Rod Mason, Department of Chemistry, University College of Swansea, Singleton Park, Swansea SA2 8PP, UK.

Bioavailability

A Symposium on the Chemical and Biological Aspects of Nutrient Availability will be held at the University of East Anglia, Norwich, UK from 21 to 24 August 1988. The symposium, which is sponsored by the Federation of European Nutrition Societies and the Federation of European Chemical Societies, aims to develop the application of advanced chemical and physico–chemical techniques of nutrient availability.

Further information from: Bioavailability 88, ARFC Institute of Food Research, Norwich Laboratory, Colney Lane, Norwich, Norfolk NR4 7UA, UK.

Analytical chemistry competition

The 16th International Competition in Analytical Chemistry will take place in the Department of Analytical Chemistry of the Institute of Chemical Technology in Prague, Czechoslovakia, 5–8 September 1988. The competition is sponsored by the Federation of European Chemical Societies (FECS) and the Czechoslovak Ministry of Education. Entry is open to three-membered teams of students accompanied by a teacher. The competition consists of both practical and theoretical parts.

Further information can be obtained from Dr Jiří Krofta, Secretary of the Organizational Committee of the XIVth ICAC, Department of Analytical Chemistry, Institute of Chemical Technology, Suchbátarova 5, 166 28 Prague 6, ČSSR.

Multiphase macromolecular systems

An International Symposium on Multiphase Macromolecular Systems will take place in San Diego, California, USA, from 19 to 23 November, 1988.

Further information from Dr Bill M. Culbertson, Ashland Chemical Company, PO Box 2219, Columbus, OH 43216, USA.

Overproduction of microbial products

The Institute of Microbiology, Czechoslovak Academy of Sciences, in cooperation with the Czechoslovak Society for Microbiology is organizing the 2nd International Symposium on Overproduction of Microbial Products. The symposium will be held in České Budějovice, 3–9 July 1988.

The symposium scientific programme will include lectures and posters grouped according to the following three themes:

- Genetic approaches to overproduction
- Physiological aspects of overproduction
- Bioengineering aspects of overproduction

Further information from: Dr J. Spížek — Scientific Secretary of the Organizing Committee, OMP 1988, Institute of Microbiology, CAS, Videňská 1083, 142 20 Prague 4, Czechoslovakia. Telex: 121341 MBU PC.

Biological reference materials
Bayreuth, FRG, 4–7 May 1988

IUPAC SPONSORED

The symposium, will be held in cooperation with the University of Bayreuth in the Schloss Thiergarten, a very scenic conference centre in a refurbished hunting lodge on the outskirts of Bayreuth.

The scientific programme includes the following plenary lectures:

- Historical views (H. J. M. Bowen, UK).
- Basic definitions (M. Hjelm, UK).
- Strategies and statistics (J. K. Taylor, USA).
- Philosophy and prospects of producers of reference materials (K. Okamoto, Japan; H. Marchandise, Belgium; B. Reed, USA).
- Technical aspects of the preparation of RMs (H. Muntau, Italy).
- Certification of main and trace elements (B. Griepink, P. Wagstaffe, Belgium; R. R. Greenberg, USA).
- Needs for the production of RMs for organic compounds (S. Wise, USA; J. Jacob, FRG, D. E. Wells, UK).
- Marine applications (S. S. Berman, Canada).
- Agricultural applications (M. Ihnat, Canada).
- 2nd generation RMs (J. Versieck, Belgium).

Contributed papers (20 minute lectures) and poster communications will cover the following topics: production, investigation and use of reference materials in the analytical, biological, biomedical, clinical, environmental, and nutritional communities including interlaboratory comparisons. The symposium will be conducted in English.

Registration fees are DEM 200 (approx. USD 120) before 15 April 1988 or DEM 240 (approx. USD 140) after 15 April 1988. The fee entitles the registrant to participate both at the scientific programme and the conference reception, a copy of the final programme, an abstracts volume, a copy of the special issue of *Fresenius Zeitschrift für Analytische Chemie*, Springer Verlag (to be mailed after the symposium) and refreshments during the breaks. Affiliates are entitled to 10% reduction of registration fee.

Accommodation is available in local hotels at rates ranging from DEM 50 to DEM 100.

Bayreuth is located in a very scenic region of Bavaria approximately 150 km north-east of its capital, Munich, and is surrounded by beautiful forests. It is famous all over the world for its Richard Wagner festivals and historic buildings. Bayreuth can be reached by plane from Frankfurt or by train. Staff members and a considerable number of the students of the modern University of Bayreuth speak English. In May, weather in this region might be cool with average temperatures around 10°C.

Drug testing in competitive athletics
Island of Brioni, Yugoslavia, 29 May –3 June 1988

IUPAC SPONSORED

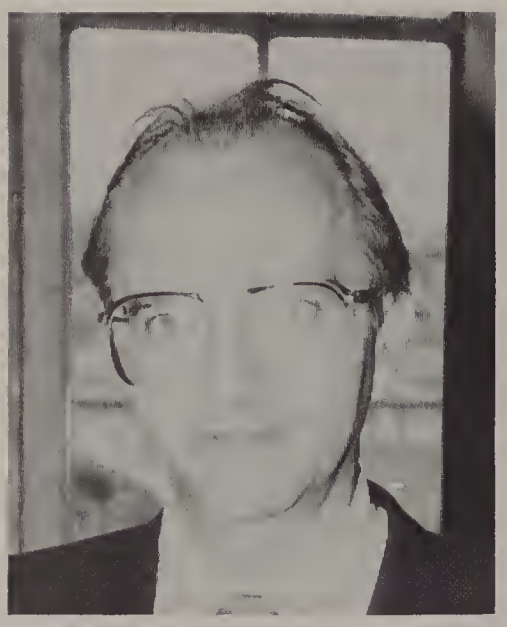
The tremendous surge of interest in drug testing of athletes has stimulated some clinical chemists involved in the work of IUPAC to organize a conference on this important topic. The organizing group is the Commission on Toxicology of the Clinical Chemistry Division of IUPAC under the auspices of the International Federation of Clinical Chemistry.

The conference will take place on the idyllic Island of Brioni in the Adriatic Sea off the coast of Yugoslavia and will be held 29 May–2 June 1988. This location was the retreat of President Tito and it has recently been converted into a superb convention centre. The island is quiet and is perfect for a small conference such as the one being organized on drug testing in athletes.

The major focus of the conference will be on mass spectrometric techniques with the detection of anabolic steroids being emphasized. The plenary lecturers include D. H. Catlin, D. A. Cowan, R. Dugal, H. W. Durbeck, R. Hampl, A. Ljungquist, S. Rendic, J. R. Shipe and S. D. Vesselinovitch. These speakers include major representatives of the drug testing programmes of the Olympic Games held in Montreal (1976), Sarajevo (1984), Los Angeles (1984) and Universitade '87 Zagreb.

The conference is being organized in a manner so as to facilitate discussion with exchange of information and ideas. The plenary sessions will introduce and review a topic, and will be followed by open forum discussions of those topics.

Contributed papers are being solicited on all phases of the topic of drugs in competitive



John Savory, President of the Organizing Committee of the International Symposium on Drugs in Competitive Athletics and past Chairman of the Commission on Toxicology (VII.4).

athletics. The deadline for submission of an abstract is 1 March 1988.

Further information on this conference can be obtained from Dr John Savory, University of Virginia Medical Center, Department of Pathology, Clinical Laboratories, Box 168, Charlottesville, Virginia 22809, USA.

Surface and colloid science
Hakone, Japan, 5–10 June 1988

IUPAC SPONSORED

The 6th International Conference on Surface and Colloid Science will be held at the Sengokubara Culture Center and neighbouring facilities in Sengokubara Heights, Hakone, Fuji-Hakone-Izu National Park.

The conference scientific programme will emphasize recent developments in science and technology related to surface and colloid science. The sessions will be on the following themes:

1. Organized molecular assemblies in solution.
2. Organized molecular assemblies at interface.
3. Solid surface and catalysis.
4. Biosurfaces and biocolloids.
5. Fine particles and dispersed systems.
6. New technologies related to colloid and interface phenomena.

The programme will consist of the plenary and invited lectures and oral and poster presentations of submitted papers. The official language of the conference will be English. Simultaneous translation will not be available.

The following plenary lectures are scheduled:

- Dynamic (i.e. viscous) interactions between surfaces separated by thin liquid and polymer films (J. N. Israelachvili, Santa Barbara, USA).
- Molecular assembly design (H. Kuhn, Göttingen, FRG).
- Colloid science of ceramic powders (E. Matijević Clarkson, USA).
- Conceptual advances in organized solution (K. Shinoda, Yokohama, Japan).
- The molecular surface science of organic monolayers (G. A. Somorjai, Berkeley, USA).
- Colloidal metals: past, present and future (J. M. Thomas, Royal Institution, UK).
- Forces between colloidal particles and phase equilibria (H. Wennerström, Kemicentrum, Sweden).

The social programme of the conference will include a reception, mixer, banquet and excursion. There will also be family programmes and optional tours.

The registration fees for active members are JPY 40 000 (before 31 March 1988) and JPY 50 000 (after); for students JPY 25 000 and for accompanying members JPY 10 000. Accommodation in local chalets and hotels will be arranged by the Organizing Committee.

The conference sites, the Sengokubara Culture Center, Surugadai Gakuen Hakone Seminar House, and Nagao Kaikan are located in Sengokubara Heights, just behind Ngao Pass, which is the upper part of Hakone in Fuji-Kakone-Izu National Park. This mountainous resort is rich in beautiful views of lakes, streams, hills, valleys, forests and volcanic hot springs. The conference occurs just before the rainy season in Japan so fine weather is expected. The temperature will be in the range 15–20°C.

The mathematics of poster distribution

The distribution of posters on boards is written in the form

$$\frac{S.P_i - S.P_f}{B_i - B_f}$$

where *S, P* and *B* denote section, poster and board numbers, respectively. Subscripts "i" and "f" stand for "initial" and "final". For example, if your poster number is *P*, then board number (*B*) is

$$B = B_i + P - P_i.$$

Taken from the Scientific Programme *of the 31st International Congress of Pure and Applied Chemistry held in Sofia.*

Modified polymers
Bratislava, Czechoslovakia, 5–8 July 1988

IUPAC SPONSORED

The 7th Bratislava International Conference on Modified Polymers will be held in the Congress Hall of the Trade Union House in Bratislava. The conference scientific programme will focus on the preparation and properties of modified polyolefins. There are four topics:

1. Chemical modification of polyolefins (i.e. grafting on to polyolefin chains, functional groups, crosslinking).
2. Regulation of supermolecular structure and its influence on the properties of polyolefins.
3. Additives to polyolefins (prodegradants, flame retardants, stabilizers, antistatics, antioxidants, fillers).
4. Polyolefin-based blends and composites.

Invited lectures will include:

- Localization of oxidation in polyolefins (N. C. Billingham, Brighton, UK).
- Compatibility in blends of modified polyolefins (E. F. Karasz, Amherst, USA).
- Influence of composition, processing and crystallinity conditions on the properties of polypropylene-based blends (E. Martuscelli, Arco Felice, Italy).
- Performance polyolefin composites by chemical modification (M. Rätzsch, Dresden, GDR).
- Modification of polyolefins by antioxidants and stabilizers (G. Scott, Birmingham, UK).

The working language of the conference will be English. No translation facilities will be available. All materials for publication must be submitted in English.

The registration fees are: for active participant USD 140; student USD 85; accompanying person USD 60. Accommodation will be available in a student dormitory and local hotels.

The programme includes two half-day and two all-day excursions to Bratislava and surroundings.

- Transport of organic vapours and liquids in poly (vinyl chloride) (A. R. Berens, Ohio, USA).
- Vinyl chloride polymers and their use in polymer blends (D. Braun, Darmstadt, FRG.
- Directions in the science of poly(vinyl chloride) — an industrial perspective (C. N. Bush, Ohio, USA).
- Chemical transformations of PVC and related polymers during degradation and stabilization (B. Iván, Ohio, USA).
- Radical polymerization of vinyl chloride and the processibility of poly(vinyl chloride) (R. Lukas, Prague, Czechoslovakia).
- Structure and rheological properties of vinyl chloride polymer melts (J. Lyngaae-Jorgensen, Lyngby, Denmark).

Dr P. Čefelín, Chairman of the Prague Meetings on Macromolecules.

Poly(vinyl chloride)
Prague, Czechoslovakia, 18–21 July 1988

IUPAC SPONSORED

The 31st Microsymposium on Macromolecules will be held at the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague. The microsymposium is intended to be a discussion forum for recent developments relating to PVC.

Topics to be covered at the meeting are:

1. Polymerization, copolymerization, chemical structure polymerization products.
2. Morphology, physicochemical properties of vinyl chloride (co)polymers, blends and alloys.
3. Chemical transformations, degradation, stabilization, modification of vinyl chloride (co)polymers.
4. Rheology, processing, compounding of vinyl chloride (co)polymers and their blends (alloys).

The main invited lectures are:

- The latest achievements in the field of degradation and stabilization of vinyl chloride (co)polymers (K. S. Minsker, Ufa, USSR).
- The vinyl chloride suspension polymerization and the control of polymer properties (P. V. Smallwood, South Glamorgan, UK).
- Search for vinyl chloride polymers with improved thermal stability (E. Sörvik, Göteborg, Sweden).
- Structure and mechanism in the free-radical copolymerization of vinyl chloride (W. H. Starnes, Jr, New York, USA).
- Models of the emulsion polymerization of vinyl chloride (G. Reinisch, Berlin, GDR).
- Assessment of degree of fusion of poly(vinyl chloride) (A. Rudin, Ontario, Canada).

All participants are invited to take part in a programme of social events. There will also be an accompanying persons programme. Accommodation will be available in halls of residence within easy reach of the Institute by public transport.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1988

Biological Reference Materials

4–7 May. Third International Symposium on Biological Reference Materials. Bayreuth, Federal Republic of Germany. (Dr Marcus Stoeppler, KFA, Institut für Chemie, Postfach 1913, D5170 Jülich, Federal Republic of Germany.)

Drugs in Competitive Athletics

29 May–3 June. First International Symposium on Drugs in Competitive Athletics. Islands Brioni, Yugoslavia. (Prof. Mirna Mikac-Dević, Institute of Clinical Chemistry, Medical High School, Hospital "Dr M. Stojanovic", Vinogradska 29, 41000 Zagreb, Yugoslavia.)

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan. (Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1–5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Surface and Colloid Science

5–10 June. 6th International Conference on Surface and Colloid Science. Hakone, Japan. (Prof. K. Meguro, General Secretary of 6-ICSCS, c/o Division of Colloid and Surface Chemistry, The Chemical Society of Japan, 1–5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Chemistry Teaching Methodology

22–25 June. First International-Argentinian Meeting on Methodology in the Teaching of Chemistry (PRAIMEQ-1). San Luis, Argentina. (Prof. L. Cascarini de Torre, Instituto de Investigaciones Fisicoquímicas, Teóricas y Applicada (INIFTA), Casilla de Correo 16, Sucursal 4, 1900 La Plata, Argentina.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France. (Prof. P. Caubère, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-lès-Nancy Cédex, France.)

Modified Polymers

5–8 July. 7th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia. (Dr A. Romanov, Polymer Institute CCR of the Slovak Academy of Sciences, 842 36 Bratislava, Czechoslovakia.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia. (Dr P. Čefelín, Scientific Secretary, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Biotechnology

17–22 July. 8th International Biotechnology Symposium. Paris, France.

(Prof. G. Durand, President, Organizing Committee, c/o Société Française de Microbiologie, 28 rue du Docteur Roux, 75724 Paris Cedex 15, France.

Photochemistry

17–23 July. 12th International Symposium on Photochemistry. Bologna, Italy.
(Prof. V. Balzani, Dipartimento di Chimica, Università degli Studi, Via Selmi 2, 40126 Bologna, Italy.)

Poly(Vinyl Chloride)

18–21 July. 31st Microsymposium on Macromolecules: Poly(Vinyl Chloride). Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshidi-machi, Sakyo-ku, Kyoto 606, Japan.)

Inorganic Ring Systems

8–12 August. 5th International Symposium on Inorganic Ring Systems. Amherst, Mass., USA.
(Prof. R. R. Holmes, Department of Chemistry, University of Massachusetts, Amherst, MA 01003, USA.)

Carbohydrates

14–19 August. 14th International Carbohydrate Symposium. Stockholm, Sweden.

University of Surrey: venue of the 3rd International Symposium on Solubility Phenomena.

XIVth ICS 1988, c/o Stockholm Convention Bureau, Box 6911, S-10239 Stockholm, Sweden.)

Solution Chemistry

15–18 August. 19th International Conference on Solution Chemistry. Lund, Sweden.
(Prof. Sten Ahrland, Inorganic Chemistry 1, Chemical Center, University of Lund, PO Box 124, S-221 00 Lund, Sweden.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Nator, Maiji College of Pharmacy, 1-22-1, Tanashi-shi, Tokyo, Japan.)

Thermal Analysis

21–25 August. 9th International Congress on Thermal Analysis. Jerusalem, Israel.
(Prof. M. Steinberg, Department of Inorganic & Analytical Chemistry, The Hebrew University, Jerusalem 91 904, Israel.)

Physical Organic Chemistry

21–27 August. 9th International Conference on Physical Organic Chemistry.
Regensburg, Federal Republic of Germany.
(Prof. J. Sauer, University of Regensburg, Institut für Organische Chemie, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Solubility Phenomena

23–26 August. 3rd International Symposium on Solubility Phenomena. Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Department of Chemistry, University of Surrey, Guildford, Surrey GU2 5XH, UK.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

Coordination Chemistry

29 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. J. de O. Cabral, Department of Chemistry, Faculdade de Cieñcias, 4000 Porto, Portugal.)

Molecules and Molecular Crystals

29 August–3 September. International Symposium on the Electronic Structure and Properties of Molecules and Molecular Crystals. Cavtat-Dubrovnik, Yugoslavia.
(Prof. Z. B. Maksic, Ruder Bošković Institute, 41001 Zagreb, Bijenička 54, Croatia, Yugoslavia.)

Macrocyclic Chemistry

4–8 September. 13th International Symposium on Macrocyclic Chemistry. Hamburg, Federal Republic of Germany.
(Prof. A. Knöchel, Institut für Anorganische und Angewandte Chemie, Universität Hamburg, Martin-Luther-King-Platz 6, 2000 Hamburg 13, Federal Republic of Germany.)

Organometallic Chemistry

4–9 September. 13th International Conference on Organometallic Chemistry. Turin, Italy.
(Prof. Luciano Milone, Istituto di Chimica Generale ed Inorganica, Facoltà di Farmacia, Università di Torino, Via P. Giuria 9, I-10125 Turin, Italy.)

Raman Spectroscopy

5–9 September. XIth International Conference on Raman Spectroscopy. London, UK.
(Dr John F. Gibson, Secretary (Scientific), Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.)

1989

Fats

6–9 June. International Congress Chevreul or Study of Fats. Angers, France.
(Dr A. Karleskind, Laboratoires Wolff, Analyses, Expertises, Recherches, 15 rue Charles Paradinas, F–92110 Clichy, France.)

Molecular Design of Functional Polymers

26–28 June. International Symposium on Molecular Design of Functional Polymers. Seoul, Korea.
(Prof. Tae Oan Ahn, Vice President — Polymer Society of Korea, Rm 601, Kyecheon Building, 831, Yeoksam-dong, Kangnam-ku, Seoul 135, Korea.)

Coordination Chemistry

2–7 July. 27th International Conference on Coordination Chemistry. Queensland, Australia.
(Prof. C. J. Hawkins, Department of Chemistry, University of Queensland, Australia.)

Analytical Chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Dr J. D. R. Thomas, Applied Chemistry Department, UWIST, PO Box 13, Cardiff CF1 3XF, UK.)

IUPAC Congress

2–7 August. 32nd International Congress. Stockholm, Sweden.
(IUPAC, c/o Stockholm Convention Bureau, PO Box 6911, S-102 39 Stockholm, Sweden.)

IUPAC General Assembly

9–17 August. 35th IUPAC General Assembly, Lund, Sweden.
(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Ichiro Murata, Dept. of Chemistry, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan.)

1990

Natural Products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Prof. Sukh Dev, Malti-Chem Research Centre, Nandesari, Baroda-39340, India.)

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Dr W. Fritsche, Gesellschaft Deutscher Chemiker, Carl Bosch Haus, Postfach 900440 Varrentrappstrasse 40-42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical Organic Chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitshak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000 Israel.)

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Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)
Telephone: + 44 (865) 717744 Telex: 83220 IUPAC G Telegrams: IUPAC OXFORD
Fax: + 44 (865) 726753 (Groups 2 & 3) attn. IUPAC

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 41 countries, each represented by a national organization, such as an academy of science or research council.

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IUPAC

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Front cover: Water pollution research and control (see p. 89).

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The best of Boston

Lewis Coles

In this "Guest Editorial", Lewis Coles, Vice-President of the Applied Chemistry Division, looks back on the 34th General Assembly in Boston and describes his lasting impressions.

Lewis Coles, Applied Chemistry Division Vice-President and member of the *Chemistry International* Editorial Advisory Board.

Boston is the capital of Massachusetts and New England's most important seaport with one of the finest natural harbours in the USA. Harvard Business School and MIT (Massachusetts Institute of Technology) now symbolize Boston's contribution to the intellectual and technical progress of American business, industry and culture.

The 34th General Assembly got under way towards the end of the third week in August last year at Boston University. Those who appeared in advance of the main Assembly experienced an unusual heatwave which had the air-conditioning plants working to full capacity. By the time most of the 700 delegates from 45 countries had arrived conditions were back to normal but only on rare formal occasions were jackets worn.

"Fully stretched" Secretariat staff Ulrike Inglis (left) and Mary Patterson: "I wish I could read the writing".

The programme of meetings was as extensive as ever and the facilities at the Secretariat were stretched to the full.

Unlimited seconds

One of the most successful events was the open meeting of the Applied Chemistry Division on the 24th August. Apart from the fact that everyone wanted to know what everyone else was doing the announcement that wine and cheese would be available with unlimited seconds may have had something to do with the popularity of the meeting.

Ludmilla Golovleva, Titular Member of the Commission on Agrochemicals (VI.5) and Applied Chemistry Division Secretary Roy Greenhalgh (right) at the Division open meeting where "unlimited" quantities of wine and cheese were available.

The Red Sox

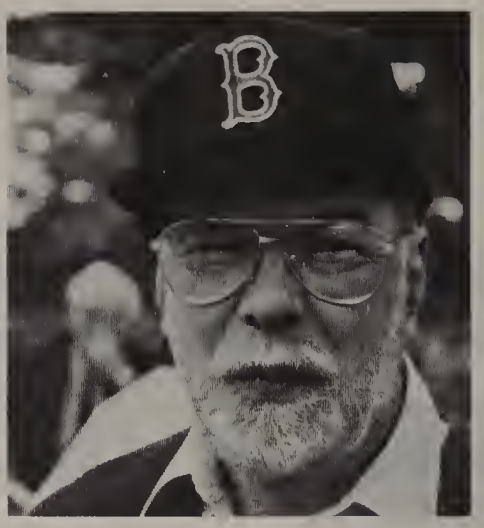
Registration took place in the Boston University Science Center, which was a good location being situated in the vicinity of the various schools of learning where the meetings were held. It was a happy coincidence that within throwing distance of the halls of residence was the famous Red Sox baseball ground. Many of the delegates attended, some on more than one occasion, and the tickets were snapped up as soon as they became available. The friendly Bostonians were very curious about the game of cricket and wanted to know the rules. To a baseball fan it was not easy to explain.

The ultimate film experience

Many of the favourite sight-seeing locations in and around the Boston area were available for the delegates and their companions. These included a tour of historic Boston and the freedom trail, a full-day tour of Salem and Marblehead (which has one of the most famous harbours in the world), a tour of Cambridge and an all-day whale watch (whales have fun too!).

The reception at the Mugar Omni Theater in the Museum of Science had to be experienced to be believed. It was the ultimate film experience where the tilted dome screen was so large that a humpback whale appears lifesize. Around, in front, behind, on all sides, everything moved, with the sound coming from every direction. Together with the generous hospitality provided it was a very memorable evening.

In addition to all this, perhaps the highlight of the Assembly must have been the "clam-bake" held again within the vicinity of the Science Center and the residential accommodation. Hundreds of delegates and their companions feasted on lobster, steaks and many other delicacies swilled down with wine and lager beer.



Applied Chemistry Division President Phil Kearney at the Clam Bake makes a bid for the *CI* fashion page.

Raison d'être

The social programme should not detract from the purpose of the Assembly. The meetings of the Commissions and Divisions and the mini-symposia were of the highest calibre and subsequent reports will bear this out. There is no doubt that the 34th General Assembly was one of the best ever and should encourage members of IUPAC bodies to attend in ever increasing numbers in the future. Let us hope that the 35th General Assembly in Lund, Sweden, 9–18 August, 1989 will be as successful.

News & Views

Affiliate numbers increase

IUPAC affiliate numbers increased by 40% in 1987. In the first year of operation, 1986, almost 5600 chemists from 40 countries registered as IUPAC affiliates (see table opposite). Last year saw the number increase to 7856 with membership in almost 90 countries. Over 80 of these memberships were handled directly from the IUPAC Secretariat. The remainder (7775) were handled by national affiliate membership secretaries. *A list of names and addresses of these secretaries is available from the Affiliate Affairs Secretary (see below).*

In 1986, 79% of the affiliate membership came from the USA. This proportion dropped to 65% in 1987. The number of affiliates from Third World countries increased in 1987 to just over 700 from 52 countries. The corresponding figures in 1986 were 293 affiliates from 24 Third World countries. Many of these affiliates were sponsored by means of grants from UNESCO and ICSU (International Council of Scientific Unions).

At the time of writing (January 1988) indications are that the affiliate numbers will stabilize this year or even fall slightly. One of the reasons for this is possibly the increase of the IUPAC component of the affiliate subscription (see Secretary General's Column, page 62, March 1988 issue of *CI*). Furthermore, unlike the two previous years, IUPAC did not send out promotional leaflets inviting chemists to become affiliates in 1988.

Support for affiliate membership in Third World countries will continue this year and also in 1989. At the Boston General Assembly in 1987, Council agreed to provide USD 5000 in each year to enable young chemists from developing countries to become IUPAC affiliates free of charge.

Chemists from countries not already operating the affiliate scheme may apply for IUPAC affiliate membership directly to the Affiliate Affairs Secretary. A limited number of "sponsored" (free) affiliate memberships is available for Third World chemists aged 35 or less. Membership applications and enquiries should be made to: Affiliate Affairs Secretary, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK.

Affiliate numbers 1986 and 1987

Country	1986	1987
Afghanistan	0	1
Algeria	2	4
Arab Republic of Egypt	0	28
Argentina	43	31
Australia	0	1
Austria	0	4
Bahrain	0	3
Belgium	0	1
Botswana	0	1
Brazil	20	25
Bulgaria	0	15
Cameroon	0	26
Canada	0	3
Central African Republic	0	1
Chile	16	27
China (Peoples Republic)	21	24
China (Taiwan)	0	4
Colombia	10	17
Cuba	0	1
Cyprus	0	1
Czechoslovakia	0	244
Denmark	15	26
Ethiopia	10	36
Federal Republic of Germany	37	42
Fiji Islands	0	1
France	1	127
Ghana	6	24
Guinea	0	1
Hungary	10	10
India	20	45
Indonesia	0	25
Ireland	5	5
Iraq	0	4
Italy	0	146
Jamaica	1	1
Japan	323	416
Jordan	1	7
Kenya	17	27
Kuwait	0	18
Lao PDR	0	1
Lebanon	1	1
Libya	0	1
Luxembourg	0	1
Malawi	0	25
Malaysia	66	62
Malta	0	1
Mexico	1	1
Morocco	0	5
Mozambique	0	20
Nepal	0	1
Netherlands	0	37
New Zealand	20	22
Nigeria	1	1
Pakistan	0	2
Panama	0	31
Papua New Guinea	24	25
Paraguay	0	1
Peru	0	40
Philippines	10	21
Portugal	0	12
Qatar	0	1
Republic of Korea	15	19
Republic of South Africa	0	240
Romania	0	1
Rwanda	0	25
Saudi Arabia	1	3
Senegal	0	1
Singapore	29	34
Solomon Islands	1	0
Spain	0	1
Sri Lanka	9	22
Sudan	0	2
Sweden	6	10
Switzerland	3	15
Tanzania	1	1
Thailand	10	26
Trinidad	0	1
Tunisia	0	4
Turkey	58	81
UK	350	428
Uruguay	9	15
USA	4412	5125
USSR	0	44
Venezuela	0	1
Vietnam	0	1
Yemen	0	4
Yugoslavia	1	1
Zaire	0	11
Zambia	1	1
Zimbabwe	0	4
Total no. of affiliates	5587	7856
Total no. of countries	40	89

Toxicology Commission to recruit affiliates

Prof. Philippe Grandjean, Chairman of Commission VII.4 (Toxicology) has suggested to colleagues on the commission that they become IUPAC affiliates. He is also contacting all affiliates who have registered an interest in the commission to inform them about current activities in toxicology and to invite them to participate in the work of the commission.

Logo design contest

Entries are invited for the design of a LOGO for the International Union of Crystallography. The prize is USD 1000 in IUCr publications or USD 600 in cash, as chosen by the winner.

All designs must be received by the IUCr Logo Committee, c/o Prof. Kaarle Kurki-Suonio, Department of Physics, University of Helsinki, Siltavuorenpenger 20 D, SF-00170 Helsinki, Finland. Telephone + 358 (0) 650211. Telex 122229 nuphu sf. Telefax + 358 (0) 656591.

Each entrant is limited to a maximum of three designs. The logo may contain the initials IUCr but this is not essential. The logo suggestion should be transmitted by registered mail and must be submitted by registered mail and must be submitted under a pseudonym. The entrant's real name and address must be supplied in a sealed envelope. The designs should be drawn on sheets no larger than standard A3 size (29.7 cm × 42.0 cm).

The closing date for the contest is 15 July 1988. Enquiries and requests for further information may be made to any member of the Logo Committee: Prof. Kaarle Kurki-Suonio (address above); Prof. Sydney R. Hall, Crystallography Centre, University of Western Australia, Nedlands, Western Australia 6009, Australia. Telephone + 61 (9) 380 2725/380 2738; or Dr Moreton Moore, Department of Physics, Royal Holloway and Bedford New College, University of London, Egham, Surrey TW20 0EX, England. Telephone + 44 (784) 39941. Telex 935504.

We regret to record the death of:

Dr S. Angus, UK (7 December 1987) — Commission on Thermodynamics (1973–87).

Prof. I. V. Berezin, USSR (5 June 1987) — Committee on Teaching of Chemistry (1974–80).

Prof. P. Métais, France (28 November 1987) — Clinical Chemistry Section Committee (1967–73), Commission on Quantities and Units in Clinical Chemistry (1967–83).

Polymer analysis and characterization

The 1st International Symposium on Polymer Analysis and Characterization will be held from 2–3 June 1988 at the University of Toronto, Canada. This two-day symposium will consist of poster sessions, invited lectures and round-table discussions on recent advances in chromatography, spectroscopy, light scattering, rheology, thermal analysis, and solution properties of synthetic and naturally occurring polymers.

For further information and registration forms please contact Howard G. Barth, 207 Welwyn Rd., Wilmington, DE 19803, USA. Tel: +1 (302) 995 3772.

Professor Valentin Koptyug, IUPAC President, explains a point at a press luncheon held at Massachusetts Institute of Technology during the Boston General Assembly. Koptyug spoke about chemistry in the USSR, chemistry and computers and IUPAC and then answered questions from the press.

At another press luncheon Past-President "Ram" Rao discussed superconductors and the development of chemistry in Third World countries.

Prof. Heinz Staab elected to Bureau

At the Boston General Assembly Prof. Heinz Staab was elected to Bureau for the period 1987–1991. Pen-portraits of other members of Bureau elected or re-elected at Boston appeared in the July 1987 issue of *CI* (pages 157–161) and the January 1988 issue (page 24) respectively.

Prof. Heinz Staab is President of the Max-Planck-Gesellschaft, President of Deutscher Zentralausschuss für Chemie and Immediate Past-President of Gesellschaft Deutscher Chemiker.

He was born in March 1926 and studied at the Universities of Marburg, Tübingen (chemistry) and

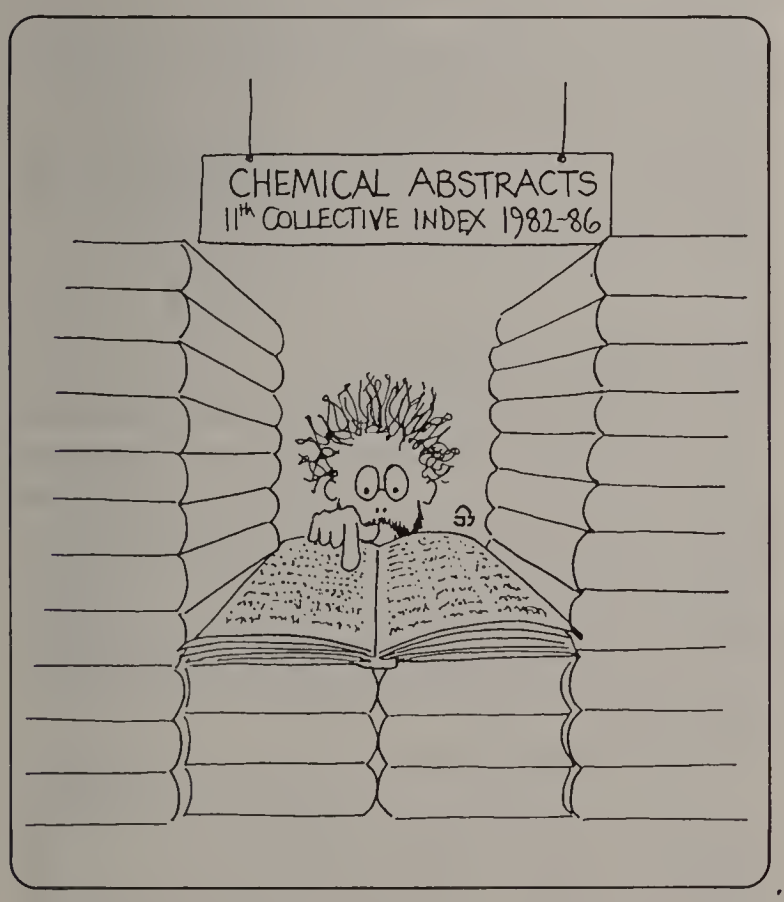
Prof. Heinz Staab.

Heidelberg (medicine). Staab obtained his Doctorate with Prof. Richard Kuhn, Institute of Chemistry, Max-Planck-Institute for Medical Research, Heidelberg in 1953. In 1959, he became a Doctor of Medicine, University of Heidelberg and was appointed Assistant Professor at the University where he has been Professor of Chemistry since 1964. Since then, during various periods at the University, he has been Director, Institute of Organic Chemistry, Dean, Faculty of Science and Mathematics, and Vice-President of the University.

From 1974 Staab has been Director, Department of Organic Chemistry, Max-Planck-Institute Heidelberg and in 1984 he became President of the Max-Planck Society. He has received many honours including the award of the "Adolf-von-Baeyer Medal" of the German Chemical Society.

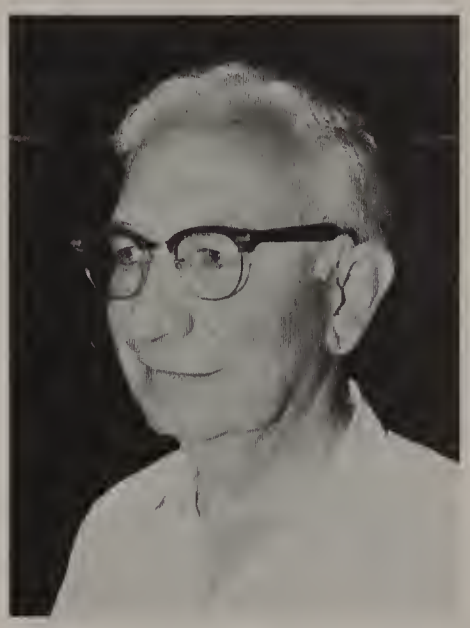
He has been an editor and member of the editorial advisory boards of several journals including *Tetrahedron* and *Tetrahedron Letters*. His fields of research have been synthetic and physical organic including: invention of "azolide" reactions, NMR investigations of internal mobility, NMR structure elucidation and mechanistic studies, new aromatic systems, cyclophanes as excimer models, solid state reactions and mechanisms of nucleophilic additions to double bonds.

Longest index in the world



The recently published *Chemical Abstracts (CA) Eleventh Collective Index* covering the period 1982–86 consists of:

	93	books
containing	28 279 169	index entries
in	162 835	pages
citing	2 812 413	documents.



Dr W. Val Metanomski: "new world record index".

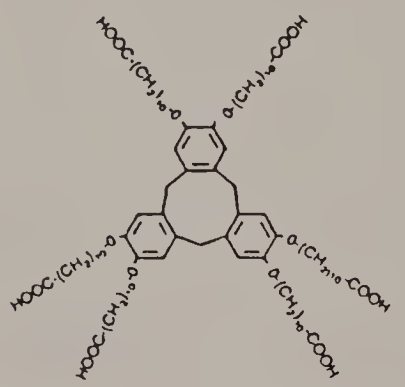
Dr W. Val Metanomski, Manager of editorial development of Chemical Abstracts service (see page 211 of the November 1987 issue of *CI*) is confident that eventually the *Guinness Book of World Records* will recognize this index as the longest index — as they have done in the past for the *9th Collective Index* (1972–76: 57 books) and the *10th Collective Index* (1977–81: 75 books).

The set of 93 books consists of:

2 books of the *Index Guide*
15 books of the *Author Index*
19 books of the *General Subject Index*
40 books of the *Chemical Substance Index*
14 books of the *Formula Index*
3 books of the *Patent Index*.

Hexapus

This is an example of a morphodelotic (shape-descriptive) name of a chemical substance. A poster on morphodelotic names was presented by Dr W. Val Metanomski at the American Chemical Society meeting in New Orleans, USA in September 1987 (see also, *CI*, pages 211 to 215, November 1987).



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Address changes

Prof. A. Björkman (Treasurer): Fax: +45 (2) 88 22 39.

Prof. J. G. Calvert (Chairman, Commission on Atmospheric Chemistry): Telex: 989764 NCAR BDR UD.

Dr H. B. F. Dixon (Chairman, IUB–IUPAC Joint Commission on Biochemical Nomenclature): Tel: +44 (223) 333672.

Prof. E. Fluck (President, Inorganic Chemistry Division): Fax: +49 (69) 791 7321.

Mr T. D. Geary (Chairman, Commission on Automation and Clinical Chemical Techniques): Division of Clinical Chemistry, Institute of Medical and Veterinary Science, PO Box 14, Rundle Mall, Adelaide, Southern Australia 5000, Australia.

Prof. P. Grandjean (Chairman, Commission on Toxicology): Fax: +45 (9) 15 84 28.

Dr B. Griepink (Chairman, Commission on Microchemical Techniques and Trace Analysis): Telex: 21877 COMEU B.

Dr R. J. Hemingway (Chairman, Commission on Agrochemicals): Telex: 847556 ICIPPJ G.

Dr D. R. Lide, Jr (Chairman, Committee on Chemical Databases): Fax: +1 (301) 975 2128.

Prof. J. W. Lorimer Chairman, Commission on Solubility Data): Telex: 0647134 UWO TEL LDN CA.

Dr A. D. McNaught (Secretary, Interdivisional Committee on Nomenclature and Symbols): Telex: 268001 CHEMSO G.

Prof. M. Ringpfeil (Chairman, Commission on Biotechnology): Forschungsbereich Biowissenschaften und Medizin, Robert-Rössle-Strasse 10, Akademie der Wissenschaften der DDR, DDR-1115 Berlin, German Democratic Republic.

Prof. M. Senda (Chairman, Commission on Electroanalytical Chemistry): Department of Agricultural Chemistry, Faculty of Agriculture, Kyoto University, Kitashirakawa, Sakyo-ku, Kyoto, 606 Japan.

CASAFA meeting in Warsaw

The eighth annual meeting of CASAFA was held at the Polish Academy of Sciences in Warsaw, Poland from 31 August to 2 September 1987. CASAFA is the International Council of Scientific Unions' Commission on the Application of Science to Agriculture, Forestry and Aquaculture.

A series of nine technical papers prepared by Polish scientists was presented and discussed during the first day of the meeting. The subjects covered included Poland's agriculture and science, physical research and soil productivity, plant breeding, photosynthesis research for yield improvement, forest protection in Poland, trends in veterinary sciences, biotechnology in 'animal breeding and husbandry, warm water fish production and fisheries research.

The complete text of these scientific papers can be obtained from: CASAFA Secretariat, PO Box 8500, Ottawa, Ontario, Canada K1G 3H9.

Intelligent molecules

Prof. Viktor Gutmann, one of the authors of "Intelligent molecules" (see January 1988 issue of *CI*) has pointed out that a line was omitted from the published article. On page 7, five lines below the equation, the sentence should have read: "However, the Mössbauer isomer shifts reveal hardly any differences in electron densities, and X-ray work shows no differences in Fe–N distances". Our apologies to the authors.

The article submitted by Prof. Gutmann was originally entitled "New frontiers of the molecular concept". Prof. Gutmann comments: ". . . to change the title to 'Intelligent molecules' may help to make our ideas more popular, although this formulation could not be maintained from our philosophical point of view. The molecules follow an intelligent pattern, which is a prerequisite for their actions. In this sense, it is also not correct to talk of intelligent products. Since this term is widely used and accepted, I have no sharp rejection to this change of the title, although I do not feel perfectly happy with it."

Fundamentals of Adsorption

The 3rd International Conference on Fundamentals of Adsorption will be held at Hotel am Schloßberg, Nürtingen (near Stuttgart), FRG, 7–12 May 1989. *Details from DECHEMA, Abt. Tagungen, POB 970146, Theodor-Heuss-Allee 25, D-6000 Frankfurt am Main 97. Tel: +49 (69) 7564-241/2/3. Telex: 412 490 dch d.*

Two commissions renamed

Commission V.1, formerly the Commission on Analytical Reactions and Reagents has now become the Commission on Analytical Reactions, Reagents, and Separations. In Division VI the Commission on Pesticide Chemistry (VI.5) has changed its name to the Commission on Agrochemicals.

Water pollution research and control

The International Association on Water Pollution Research and Control — an Associated Organization of IUPAC — will hold its next biennial conference in Brighton, UK in July. IAWPRC Executive Director Anthony Milburn describes the aims, activities, publications and membership of the association.

Water; pure, clean and sparkling, is, as any type of scientist will tell you, an important and essential substance. Dirty water, as they will also tell you, is nothing but a problem.

That is perhaps why so many branches of science have combined their knowledge and expertise to ensure that man's most precious resource is kept as clean and pure as possible. Engineers, biologists, chemists, toxicologists, to name but a few of those involved in solving the dirty water problem, are also representative of the only international organization dedicated to the subject — the International Association on Water Pollution Research and Control.

It is 25 years since a group of concerned scientists from as far afield as the USA, France, Netherlands, South Africa, Hungary and the UK organized the first international conference on water pollution research. The interest generated led to another conference two years later and the eventual formation in 1965 of what was known as the International Association on Water Pollution Research.

From 1965 to 1982 there was a substantial development in water pollution technology, much of which came from a theoretical research base. During that period IAWPRC matured and broadened its interests to include the full spectrum of water pollution control, and changed its name accordingly. Nineteen eighty-seven proved to be the Association's busiest year so far with 15 conferences in its programme of activities, a major membership campaign, and two new additions to its range of publications with the first of a technical report series and the launch of a news journal, *Water Quality International*.

IAWPRC President Prof. Poul Harremoës of the Technical University of Denmark.

Membership

IAWPRC is a membership association for professional people working in, or interested in, water pollution control. The Association is an independent, non-governmental organization, administered and managed by its members with the backing of a full-time Secretariat.

The current president of the Association is Prof. Poul Harremoës of the Technical University of Denmark, a key figure in Danish environmental affairs. He is supported by two vice-presidents, Prof. Junichiro Matsumoto of Japan, and Dr Sergio Almeida of Brazil, both of whom have played a significant role in IAWPRC's expansion during the last few years.

Encouraging cooperation, communication and understanding amongst scientists, engineers and administrators engaged in the control of water pollution is one of the primary aims of the Association. This is largely achieved through the exchange of high-quality information via IAWPRC's publications and conferences, and the enthusiasm of its membership to do this.

"Encouraging cooperation, communication and understanding amongst scientists, engineers and administrators engaged in the control of water pollution is one of the primary aims of the Association."

National membership is the principal category of membership within the Association. There are currently 41 countries involved, Kuwait and Chile being the latest additions to a very representative spread of Western, Asian–Pacific and Latin American countries. Keen interest in joining the Association is being expressed by many developing and middle-Eastern countries, probably as a result of the rapid rise in environmental consciousness throughout these regions.

Countries are represented by existing professional associations dealing with water pollution control, or by national committees set up specifically for the membership of IAWPRC. Only national members can vote, and their representatives form the governing board of the Association.

Corporate membership is IAWPRC's fastest growing area of membership and comprises consulting firms, government departments, public authorities, manufacturers, research labs and university departments. Individual membership, as its name suggests, caters for professionals who may not be part of a large organization. Both categories receive a substantial range of benefits which include Association journals, reduced conference fees, participation in specialist groups, and discounts on Pergamon Press publications.

Publications

IAWPRC's monthly journals *Water Research* and *Water Science and Technology* are internationally acknowledged and respected as leaders in the field. *Water Research* attracts high-quality refereed research papers on a wide variety of topics ranging from water quality standards, industrial wastewater treatment, acid rain, heavy metal speciation in fresh and marine waters, to the adsorption of organic compounds on to activated carbon, and the effects of anionic surfactants on the aquatic environment. *Water Science and Technology* publishes the proceedings of IAWPRC's specialized conferences and now lists over 70 different titles in its catalogue.

A new journal, *Water Quality International*, was launched this year to provide the necessary link in getting the ideas contained in the research across to the

Immobilized micro-organisms are being developed as a new method of wastewater treatment — one of IAWPRC's focal points of interest.

person in the front line of water pollution control — the practitioner. The result is a light, easy to read news magazine containing conference reports, technical features, new products, research and development news, conference diary and display advertising, which makes use of the vast amount of information available to IAWPRC. *WQI*, as the journal is known, has received a very enthusiastic response to its first two issues and seems set to gain the international reputation of its sister journals.

Another new line of publications has been established with the first in a series of scientific and technical reports. "Activated Sludge Model No 1" is a report prepared by one of IAWPRC's task groups, and is available to members and non-members at a nominal charge.

Specialist groups

Specialist groups are an area of activity that has really taken off during the last 12 months. Ten groups are already established, such as Monitoring and control of environmental contaminants, Systems analysis in water quality management, and Tastes and odours in water; and five more have recently been given approval: Marine disposal of wastewater; Use of macrophytes in water pollution control; Computing; Coagulation, flocculation and filtration; and Wastewater reclamation and reuse.

These groups reflect the new direction of research interests and broaden IAWPRC's information base. Groups vary in size from less than 20 to over 200 members, and each has its own programme of work which develops according to the interest of its members. These programmes include specialized con-

Scientists discussing water analysis techniques. Group meetings and the collection and dissemination of information are important IAWPRC activities.

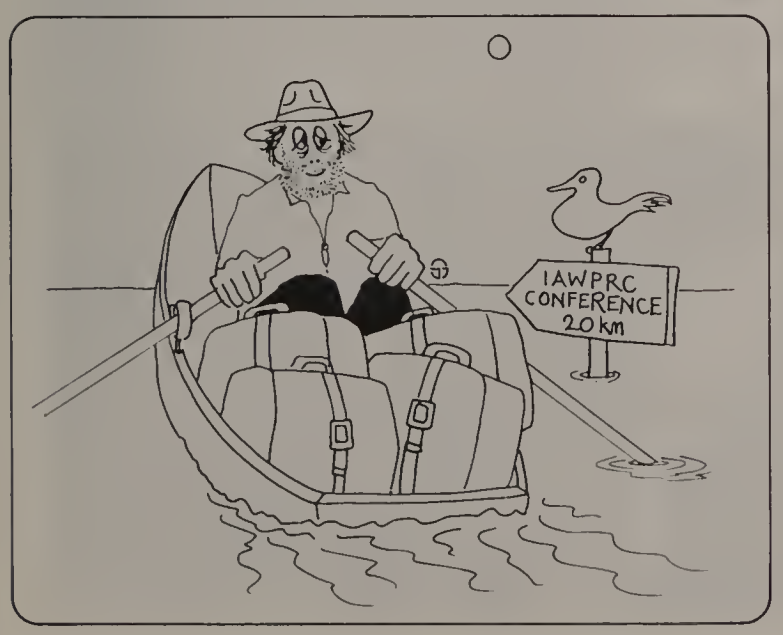
ferences and seminars, group meetings, information collection and dissemination, and group publications.

Task groups are small with a restricted membership and are usually set up to investigate or work on a specific task. One recent example is the joint IAWPRC/IUPAC Working Group on Notation for Use in the Description of Wastewater Treatment Processes, which has produced a report of recommended nomenclature to be used by both organizations.

Conferences

Conferences have long been a strength of IAWPRC, whether as host or sponsor. Organized by national members or specialist groups, they seek to present up-to-date advances in water pollution control of either a regional or specialist nature. Topics range from the 1st Asian Conference on Treatment, Disposal and Management of Human Wastes specifically aimed at the Asian–Pacific region, to the more industrialized nation problems of pollution from coal-fired power plants, and the highly specialized subjects of tastes and odours or systems analysis.

Conferences are also where IAWPRC's liaison with other organizations comes to the fore. This year sees a joint conference taking place with the International Water Supply Association on nitrogen pollution of water, a conference organized by the IAWPRC/IAHR (International Association for Hydraulic Research) joint specialist group on urban storm drainage, and IAWPRC acting as a co-sponsor with other international associations for conferences on oil pollution, water for the future, and reservoir limnology.



The highlight of the Association's conference programme is, however, its biennial conference. This provides an excellent opportunity for members, groups, and the Association's administrative committees to meet, discuss developments in water pollution control, and plan for the future. Last year's setting of Rio de Janeiro proved an attractive venue and was very successful.

The next biennial will take place in Brighton, UK, in July 1988, and will introduce innovations to the content of the biennial programme by way of one-day group workshops, round-table discussions and technical presentations by exhibitors. Exhibitions have been a strong feature of biennial conferences in recent years and are planned for biennials as far ahead as Kyoto, Japan, in 1990 and Washington, USA, in 1992.

IAWPRC is currently enjoying a period of rapid expansion across the whole range of its activities. It has acquired an excellent international reputation gained through the professionalism and expertise of its members. How the Association will develop in the future has been the subject of recent meetings, and plans have now been laid to take it well into the next century. With increasing world-wide concern about water pollution. IAWPRC's role will become of vital

IAWPRC Secretariat offices at No 1 Queen Anne's Gate.

importance in ensuring that all the experience and knowledge that it continues to accumulate is put to good and practical use wherever it may be needed.

For further information about IAWPRC; its conferences, groups or publications please contact the Executive Director, IAWPRC, 1 Queen Anne's Gate, London SWIH 9BT, UK.

Has chemical nomenclature a role in the next millenium?

As increasing machine handling of chemical structures allows chemists to pay less attention to the direct use of chemical nomenclature, systematic names will have a more limited but still important role in the retrieval of chemical information. This view was put forward by Dr Kurt Loening in a lecture on "The continuing role of trivial nomenclature" presented at an international symposium on chemical nomenclature held in London in November 1987.

Loening, who is former chairman of the Interdivisional Committee on Nomenclature and Symbols (IDCNS), said that trivial names will surely continue to be important or even grow in importance for a select number of chemicals which are important in commerce, in trade, or which are of public concern, such as pharmaceuticals, insecticides, and pollutants. This is because manufacturers, government agencies, members of the legal profession and so on require short and concise names.

The two-day international symposium was concerned with the present status and future prospects of the major chemical nomenclature systems and significant recent developments in handling techniques for chemical names, structures and related data. The meeting was sponsored by the Laboratory of the Government Chemist (LGC) in London and the Royal Society of Chemistry.

Speakers included Dr Gerry Moss, former chairman of the Commission on Nomenclature of Organic Chemistry (CNOC), whose lecture was entitled "Is chemical nomenclature obsolete?". He said that there has always been a school of thought that considers names irrelevant as graphical representations are sufficient. The advent of computer graphics and data retrieval of chemical information from structural formulae might suggest that names are less necessary today. Moss's lecture considered the needs for chemical nomenclature in communication, written material and elsewhere.

In another lecture, former CNOC secretary Dr Warren Powell asked the question "Why continue systematization of chemical nomenclature?" He justified the continuing effort to systematize chemical nomenclature and reviewed the basic principles of the subject.

Other IUPAC people participating at the symposium included Dr Danny Fagandini, member of the Committee on Chemistry and Industry (COCI) and Prof. Aubrey Jenkins, secretary of the Macromolecular Division Committee. Both chaired sessions.

In the summing up, CNOC member (and Latin scholar?) Ted Godley posed the question "*Quo vadimus?*" Godly pulled together (in English) the various strands earlier speakers had drawn out. The question "Where are we going?" was a valid one, he said, since we are now at the crossroads in the history of chemical nomenclature, where the paths of information handling, chemical development and nomenclature meet. He assessed the continuing role of applying names to chemicals against the points raised in the symposium presentations.

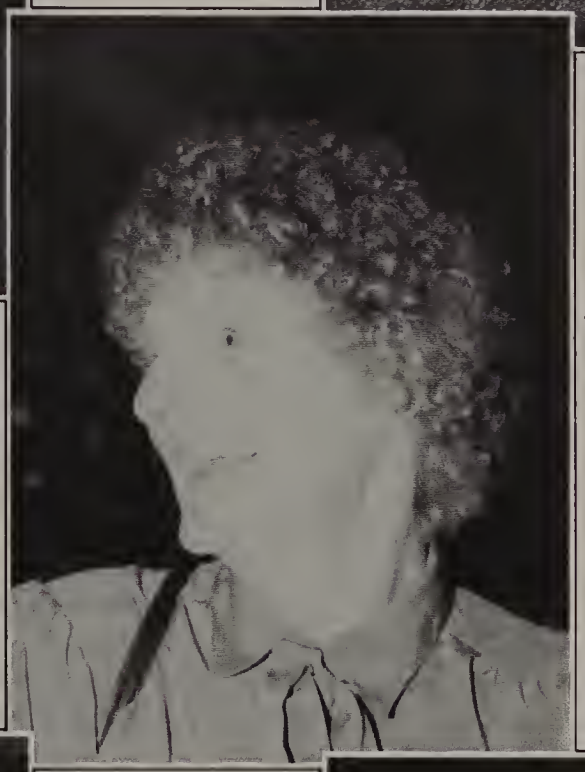
Park Lane Hotel, London, venue of the symposium "Chemical nomenclature into the next millenium — has it a role?"

Nomenclature organizations, scientific publishers and other groups display their publications and services at a symposium exhibition.

At the crossroads in the history of chemical nomenclature

▲ Tony Dunsdon, LGC symposium organizer.

▲ Alan McNaught, IDCNS secretary and symposium participant.



◀ Wendy Warr who lectured on "Future directions in the handling of information about chemicals".

Kurt Loening: "systematic names will have a more limited but still important role in the retrieval of chemical information".

▼

Hans-Georg Zoch, IUPAC affiliate from the Federal Republic of Germany at the LGC symposium.

▼

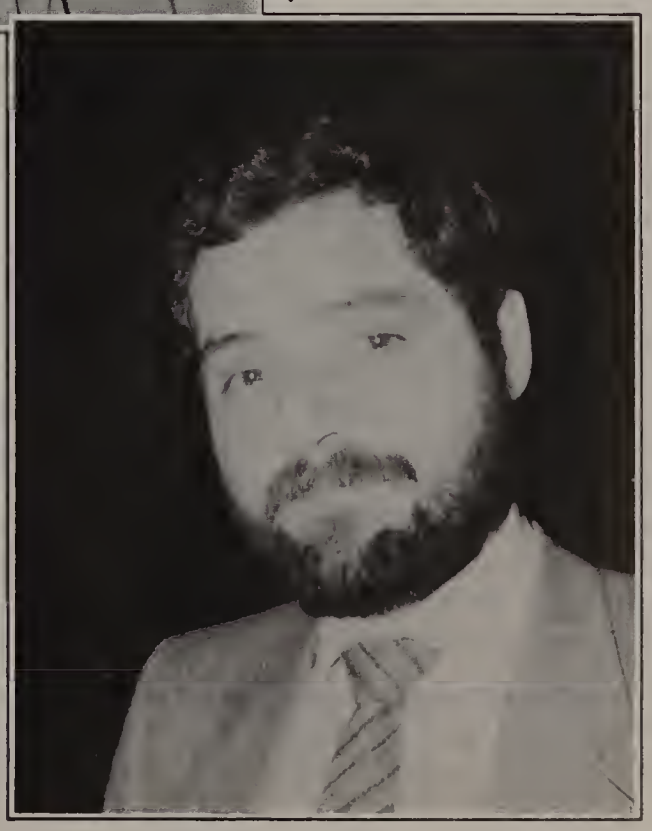


Table of atomic weights to four significant figures

In 1983, the *International Newsletter of Chemical Education published a 'Table of atomic weights to four significant figures'. The table was prepared by Norman N. Greenwood and H. Steffen Peiser at the request of the Committee on Teaching of Chemistry (CTC) in consultation with the Commission on Atomic Weights and Isotopic Abundances (II.1). The authors have now brought the table up to date. The revised version is published below.**

'Atomic weight' is the term preferred by most chemists, but 'mean relative atomic mass' is equivalent and favoured by some. Since 1961, the internationally accepted values have been scaled relative to the isotope ^{12}C taken as 12 exactly. Atomic weights are, therefore, dimensionless numbers numerically equal to the molar masses of the elements expressed in grams per mole.

The tabulated atomic weights apply to the chemical elements in their natural terrestrial isotopic composition not to artificially separated isotopes and other samples which have been subjected to processes that appreciably change the isotopic composition of the elements. For example, samples of hydrogen, which has two stable isotopes of relative atomic mass 1.007825 and 2.014102, could vary between these two extremes, but naturally occurring hydrogen always has values close to 1.0080.

Twenty elements have only one isotope that occurs in nature, and their atomic weights have been determined very precisely, always to better than one part in a million. However, most elements have more than one naturally occurring isotope. The difficulties experienced in determining the relative abundance of these isotopes, as well as their natural variation in abundance, limit the precision with which the atomic weight of most elements can be quoted.

For elements with variable isotopic composition, the atomic weight is not a 'constant of nature' but is best regarded as a property of the particular sample of that element being studied. To the four-figure precision indicated in this table, the atomic weights can safely be regarded as constants applicable to all normal sources as used in science, industry and commerce. Nevertheless, it should be pointed out that geologically highly exceptional specimens are known for at least 31 elements in which the isotopic composition leads to an atomic weight differing from the tabulated value by more than the stated uncertainty.

Where an atomic weight is known to more than four significant figures, it is abbreviated in this table to the four-figure value closest to the unabbreviated best value. If the fifth digit is five exactly, it is rounded up or down to make the fourth quoted digit even. This rule for rounding was not used in the previously published four-figure table.

Many elements, including all those of atomic number greater than that of bismuth, are radioactive with isotopes which transform into other elements in the course of time. The atomic weight of a given sample of such an element depends on the relative rate at which its various radioisotopes decay and sometimes also on the radiogenic origin of the particular sample. Many samples contain only one such radioisotope of a given element. Without identification of the radioisotopes involved and without knowledge of their applicable abundances, if more than one is present in a sample, it is not possible to quote an approximate atomic weight even to four significant figures. Therefore, in this table, the relative atomic mass of just one of the isotopes is quoted and identified by its mass number in superscript preceding the chemical symbol. This kind of listing is also used for several known artificial radioactive elements of atomic number greater than that of uranium.

The atomic weights of the elements are reviewed and assessed by the Commission on Atomic Weights and Isotopic Abundances every two years. Its biennial reports should be consulted for further details and elaboration. The most recent report on 'Atomic weights of the elements 1987' will appear in *Pure and Applied Chemistry* in 1988. It is highly unlikely that the values given here to four significant figures will be altered in subsequent revisions by more than their indicated uncertainties.

**International Newsletter on Chemical Education*, No. 20, p. 18 (1983).

Table of atomic weights to four significant figures*

(*Scaled to the relative atomic mass of $^{12}C = 12$ exactly*)

Values quoted in this table are reliable to ±1 or better in the fourth significant figure except for the five elements for which the larger indicated uncertainties apply. Each element that has neither a stable isotope nor a characteristic natural isotopic composition is represented in this table by one of that element's commonly known radioisotopes identified by its mass number (in superscript preceding the chemical symbol) and its relative atomic mass, in the Atomic Weight column.

Atomic Number	*Name*	*Symbol*	*Atomic Weight*	*Atomic Number*	*Name*	*Symbol*	*Atomic Weight*
1	Hydrogen	H	1.008	53	Iodine	I	126.9
2	Helium	He	4.003	54	Xenon	Xe	131.3
3	Lithium	Li	6.941±2	55	Caesium	Cs	132.9
4	Beryllium	Be	9.012	56	Barium	Ba	137.3
5	Boron	B	10.81	57	Lanthanum	La	138.9
6	Carbon	C	12.01	58	Cerium	Ce	140.1
7	Nitrogen	N	14.01	59	Praseodymium	Pr	140.9
8	Oxygen	O	16.00	60	Neodymium	Nd	144.2
9	Fluorine	F	19.00	61	Promethium	^{145}Pm	144.9
10	Neon	Ne	20.18	62	Samarium	Sm	150.4
11	Sodium	Na	22.99	63	Europium	Eu	152.0
12	Magnesium	Mg	24.30	64	Gadolinium	Gd	157.2
13	Aluminium	Al	26.98	65	Terbium	Tb	158.9
14	Silicon	Si	28.09	66	Dysprosium	Dy	162.5
15	Phosphorus	P	30.97	67	Holmium	Ho	164.9
16	Sulfur	S	32.07	68	Erbium	Er	167.3
17	Chlorine	Cl	35.45	69	Thulium	Tm	168.9
18	Argon	Ar	39.95	70	Ytterbium	Yb	173.0
19	Potassium	K	39.10	71	Lutetium	Lu	175.0
20	Calcium	Ca	40.08	72	Hafnium	Hf	178.5
21	Scandium	Sc	44.96	73	Tantalum	Ta	180.9
22	Titanium	Ti	47.88±3	74	Wolfram (Tungsten)	W	183.8
23	Vanadium	V	50.94	75	Rhenium	Re	186.2
24	Chromium	Cr	52.00	76	Osmium	Os	190.2
25	Manganese	Mn	54.94	77	Iridium	Ir	192.2
26	Iron	Fe	55.85	78	Platinum	Pt	195.1
27	Cobalt	Co	58.93	79	Gold	Au	197.0
28	Nickel	Ni	58.69	80	Mercury	Hg	200.6
29	Copper	Cu	63.55	81	Thallium	Tl	204.4
30	Zinc	Zn	65.39±2	82	Lead	Pb	207.2
31	Gallium	Ga	69.72	83	Bismuth	Bi	209.0
32	Germanium	Ge	72.61±2	84	Polonium	^{210}Po	210.0
33	Arsenic	As	74.92	85	Astatine	^{210}At	210.0
34	Selenium	Se	78.96±3	86	Radon	^{222}Rn	222.0
35	Bromine	Br	79.90	87	Francium	^{223}Fr	223.0
36	Krypton	Kr	83.80	88	Radium	^{226}Ra	226.0
37	Rubidium	Rb	85.47	89	Actinium	^{227}Ac	227.0
38	Strontium	Sr	87.62	90	Thorium	Th	232.0
39	Yttrium	Y	88.91	91	Protactinium	Pa	231.0
40	Zirconium	Zr	91.22	92	Uranium	U	238.0
41	Niobium	Nb	92.91	93	Neptunium	^{237}Np	237.0
42	Molybdenum	Mo	95.94	94	Plutonium	^{239}Pu	239.1
43	Technetium	^{99}Tc	98.91	95	Americium	^{243}Am	243.1
44	Ruthenium	Ru	101.1	96	Curium	^{247}Cm	247.1
45	Rhodium	Rh	102.9	97	Berkelium	^{247}Bk	247.1
46	Palladium	Pd	106.4	98	Californium	^{252}Cf	252.1
47	Silver	Ag	107.9	99	Einsteinium	^{252}Es	252.1
48	Cadmium	Cd	112.4	100	Fermium	^{257}Fm	257.1
49	Indium	In	114.8	101	Mendelevium	^{256}Md	256.1
50	Tin	Sn	118.7	102	Nobelium	^{259}No	259.1
51	Antimony	Sb	121.8	103	Lawrencium	^{260}Lr	260.1
52	Tellurium	Te	127.6				

*The table may be reprinted provided

(i) the source is acknowledged thus:
Prepared by N. N. Greenwood and H. S. Peiser, on behalf of the Committee on Teaching of Chemistry of the International Union of Pure and Applied Chemistry (IUPAC) in consultation with the IUPAC Commission on Atomic Weights and Isotopic Abundances;

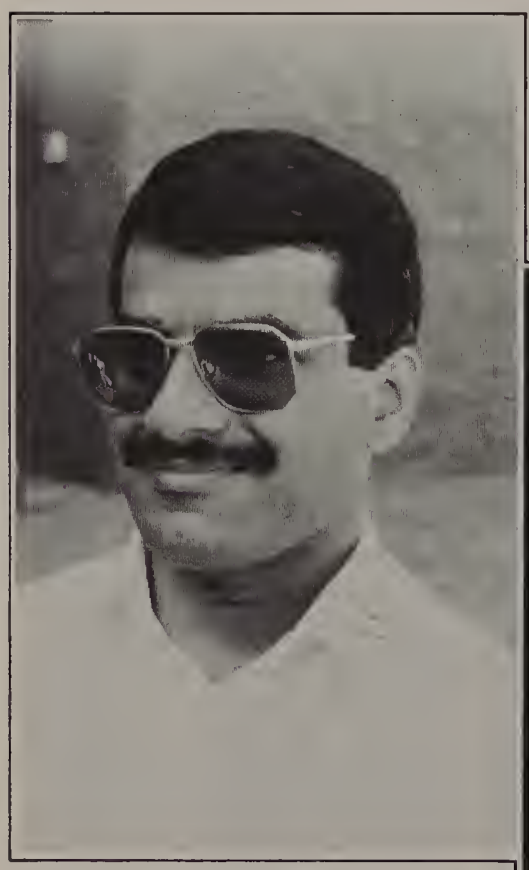
(ii) it is used in its entirety, including the paragraph at the head of the table.

Affiliates at Boston

A number of affiliates (see below) and national affiliate membership secretaries (see opposite) attended the 34th IUPAC General Assembly in Boston. Several commissions have recruited or are now in the process of recruiting affiliates. For example, the following affiliates are all actively involved in commission work:

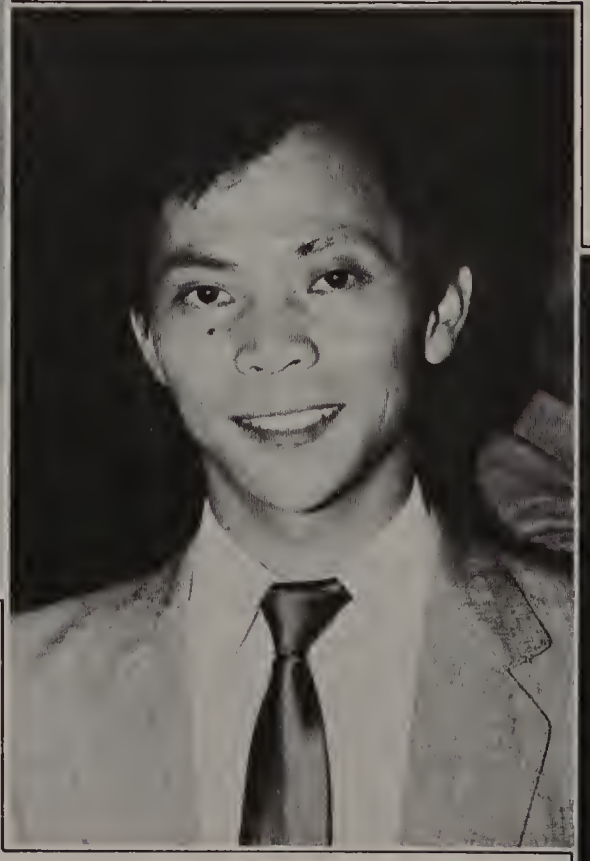
- *Commission on Thermodynamics*
  – Prof. Françoise Roquerol (France): Observer.
- *Commission on Colloid and Surface Chemistry including Catalysis*
  – Dr D. Fairhurst (USA): Associate Member.
  – Prof. M. Misono (Japan): National Representative.
  – Dr L. Ter-Minassian-Saraga (France): Subcommittee on Thin Films.
- *Commission on Nomenclature of Inorganic Chemistry*
  – Prof. S. Kirschner (USA): Observer.
- *Commission on Macromolecular Nomenclature*
  – Prof. U. W. Suter: Titular Member.
- *Commission on Solubility Data*
  – Dr J. J. Markham: Subcommittee member.
- *Commission on Atmospheric Chemistry*
  – Dr D. E. Tevault (USA): Associate Member.

In addition, the Commission on Oils, Fats and Derivatives has invited affiliates who have specified an interest in the work of the commission to participate by correspondence. The Commission on Toxicology is also contacting affiliates who have registered an interest in toxicology.



▲ **Dr Nader Al-Jalal, University of Kuwait.**

BOSTON

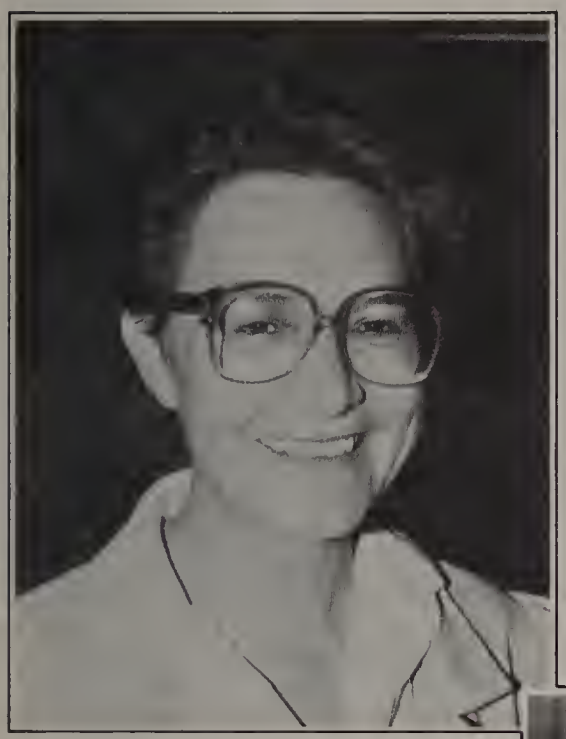


Dr Sam Li Fong Yau, National University of Singapore. ▶

Prof. Françoise Rouguerol, Centre de Thermodynamique et de Microcalorimetric du CNRS, France. ▶

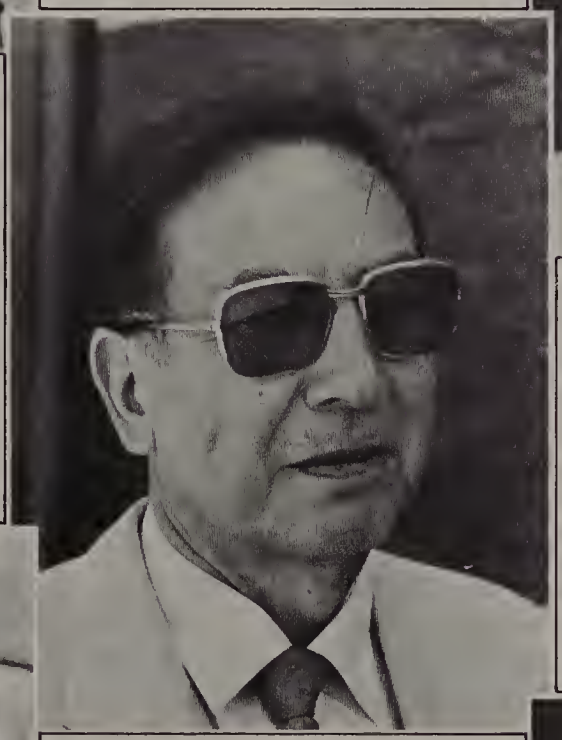
National Affiliate Membership Secretaries at Boston

BOSTON

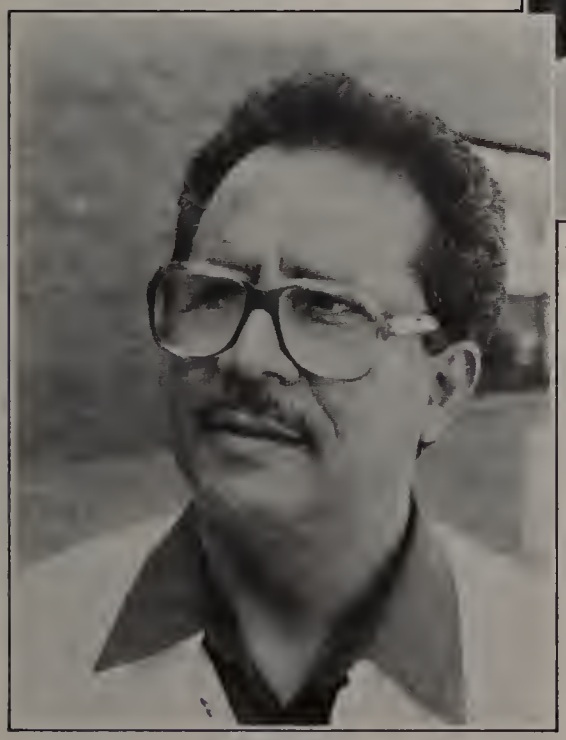


Dr Nelly de Cediel (Colombia), Past-President of Latin American Federation of Clinical Chemistry.

Dr Zoya Samoylova (USSR), Academy of Sciences of the USSR and National Committee of Soviet Chemists.



Dr Mario Silva (Chile), President of the Chilean Chemical Society.



Prof Mubarak Al-Obadie (Kuwait), President of the Kuwaiti Chemical Society.

Dr Anne Alper (Canada), Executive Director and Secretary of The Chemical Institute of Canada.

Division Presidents' Reports

BOSTON

At the Council meeting at the Boston General Assembly, Division Presidents presented reports for the biennium 1985–87. The following are highlights from these reports.

Physical Chemistry Division

Physical Chemistry Division President Dr David Lide reported that two major projects had occupied the division in the previous biennium: the completion of the new "Green Book" *Quantities, units, and symbols in physical chemistry* and the development of a plan for stronger emphasis on biophysical chemistry within the division.

The Green Book had been the main concern of the Commission on Physicochemical Symbols, Terminology and Units and the responsibility of the working party chaired by Prof. Ian Mills. The commission had also produced a four-page summary of some of the most important recommendations of the new Green Book.

The Commission on Thermodynamics had also contributed to the Green Book. This commission also considered the following feasibility studies with a view to starting them as projects:

- Definitions in dilute solutions, including electrolytes.
- PVT critical point data.
- Heat capacities of pure substances in condensed phases, data and correlations.

Two members of the commission had prepared a final report on "Suggested practice for classification of calorimeters" and this had been submitted for publication to *Thermochimica Acta*.

Lide reported that the Commission on Electrochemistry had published two documents in *Pure and Applied Chemistry* (*PAC*): "Interphases in systems of conducting phases" (Vol. 58, pp. 437–454, 1986) and "The absolute electrode potential" (Vol. 58, pp. 955–966, 1986). Two other documents had been approved by the commission: "Terminology for micro-electronic ion-selective devices in electrochemistry" and "Photoelectrochemical energy conversion".

The Commission on Chemical Kinetics had made progress on a number of projects including: "Kinetics in open systems"; *Glossary of terms used in chemical kinetics, including reaction dynamics*; and "The rate-controlling step in a chemical reaction".

The first draft of a document entitled "Secondary standards for the determination of intensities" has been circulated by the Commission on Molecular Structure and Spectroscopy. The commission has also received comments on the first two parts of an extensive document on "Notations and conventions in molecular spectroscopy".

Concerning the Commission on Colloid and Surface Chemistry including Catalysis, Lide reported that the Subcommittee on Catalyst Characterization had completed the provisional version of the *Manual on Catalyst Characterization*. The new Subcommitee on Characterization of Porous Solids had achieved its first objective with the organization of a major international symposium in the Federal Republic of Germany in April 1987.

Inorganic Chemistry Division

Inorganic Chemistry Division President, Professor Kazuo Saito reported that the division committee had proposed two new projects — one is a "IUPAC Professorship" for developing countries and the other involves the extension of division activity to bioinorganic chemistry.

The Commission on Atomic Weights and Isotopic Abundances continued its work on the revision and publication of atomic weights. In addition, an *ad hoc* working party had been set up on "Measurement, sensors and measuring instruments".

The "Red Book" had been the main concern of the Commission on Nomenclature of Inorganic Chemistry. The drafts of all the chapters had been submitted for review. There had been a great deal of discussion concerning the numbering of groups in the Periodic Table.

The South Africa delegation at the Council meeting wait for the presentation of the division presidents' reports.

Five Organic Chemistry Division Presidents past and present at the Boston General Assembly: (from left) Prof. Giorgio Modena (1983–85); Prof. Jean Mathieu (1981–83); Prof. Shô Itô (1979–81); Prof. Anders Kjaer (1973–75); and Prof. Sukh Dev (1987–89).

The Commission on High Temperature and Solid State Chemistry had produced a report on silicon nitride and another report on nomenclature of graphite intercalation compounds had been prepared. The possibility of a new project on superconductivity was under discussion with Prof. Rao.

Organic Chemistry Division

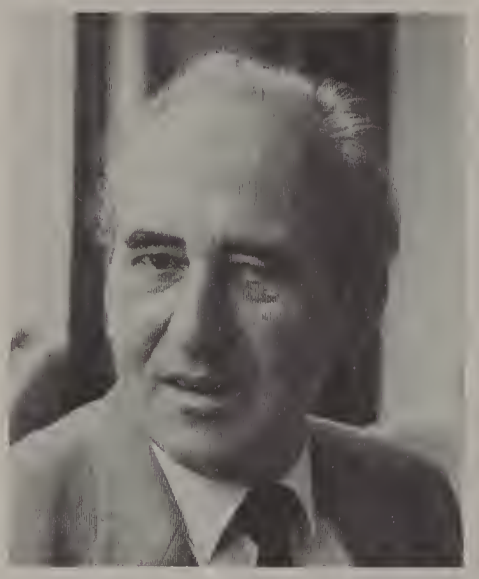
In his report to Council, Organic Chemistry Division President Prof. Joe Bunnett stated that the Commission on Nomenclature of Organic Chemistry was engaged in a major project to revise and extend the "Blue Book" entitled *Nomenclature of Organic Chemistry*. A substantial part of the revision will be provision of an introductory section concerning general principles of organic nomenclature, a feature not present in the 1979 edition. The second part will present specific rules for naming particular classes of organic compounds.

The Commission on Physical Organic Chemistry suffered a blow to its work as well as an emotional setback when its chairman, Prof. Victor Gold, died soon after the Lyon General Assembly. In 1986, the commission regrouped under the leadership of Prof. Mueller, met in Tokyo and resumed its work. The following major projects have been completed to the stage of readiness for review:

- Nomenclature of organic chemical transformations.
- Symbolization of reaction mechanisms in organic chemistry.
- Names for hydrogen atoms, ions and groups, and for reactions involving them.

Macromolecular experiment

At the Boston General Assembly, the Macromolecular Division held an informal seminar at which Professors Francesco Ciardelli, Walter Heitz and Nicolai Platé presented talks on their recent research. The titles of the talks were "Molecular and macroscopic response of photochromic polymers to light irradiation", "Cu- and Pd-assisted reactions of monomers and polymers" and "Some new results in the synthesis and properties of polymers" respectively.



Walter Heitz who presented a talk on Cu- and Pd-assisted reactions of monomers and polymers.

This was an experiment intended to explore the possibility that members of the division can teach each other about the new frontiers in their subject and, in this way, help to define the direction of future developments in the work of the division.

The commission is now working on a revised edition of the *Glossary of terms used in physical organic chemistry*.

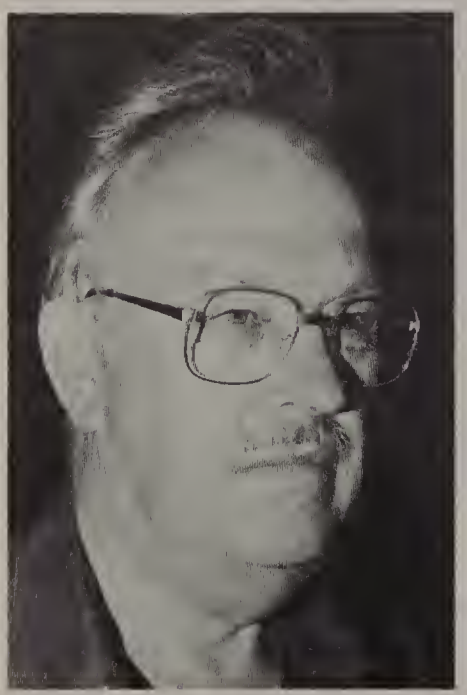
The Commission on Photochemistry is somewhat unusual in that it serves a community of scientists only some of whom consider themselves to be organic chemists. A large fraction of photochemical research and many applications of photochemistry concern the behaviour of organic compounds, but some of the photochemists whose interests are served by the commission think of themselves as physicists, physical chemists, biochemists or polymer chemists. The commission is engaged in several projects including a *Glossary of terms used in photochemistry*.

Macromolecular Division

Macromolecular Division President Prof. Takeo Saegusa reported to Council on the mail ballot undertaken by the Commission on Macromolecular Nomenclature concerning the *Compendium of Macromolecular Nomenclature*. The ballot was in favour of postponing publication of the compen-

dium until completion of several important documents. The commission decided against including biochemical-nomenclature documents. The commission also decided to include a modified version of an article on polymer nomenclature written for the *Encyclopedia of Polymer Science and Engineering*.

Preliminary drafts on the terminology for ageing and stabilization of polymers, and for polyelectrolytes and polycomplexes were critically examined by the commission. The commission also considered participation in the revision of a joint document on "International vocabulary of basic and general terms in metrology".

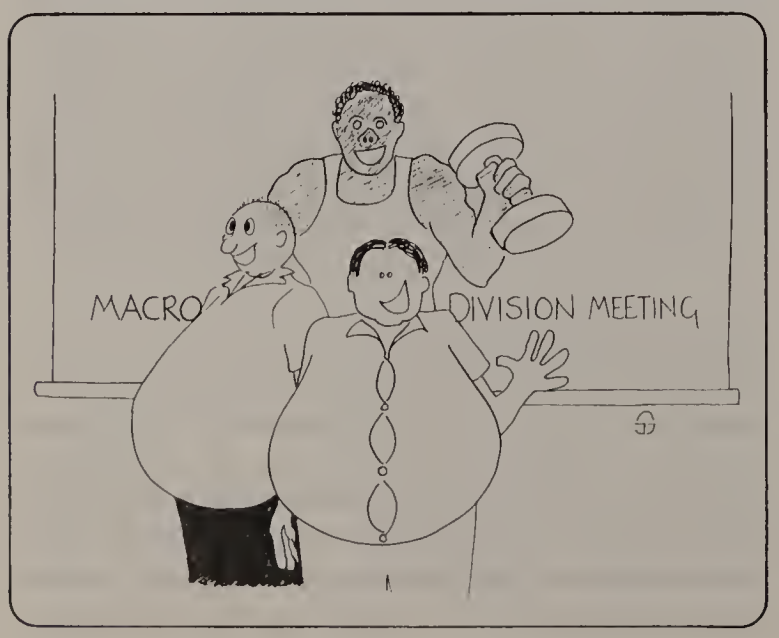


Prof. Aubrey Jenkins, Secretary of the Macromolecular Division.

The working parties of the Commission on Polymer Characterization and Properties had been very active during the biennium. The Working Party on Structure and Properties of Commercial Polymers had published several documents in *PAC* and initiated a programme on "Melt rheology and concomitant morphology in polyblends and polyalloys".

The Working Party on Molecular Characterization of Commercial Polymers is engaged in several programmes including "Molecular characterization of linear low density polyethylenes (LLDPE)" and "Branching frequence distribution of low density polyethylenes".

The Working Party on Thermal Properties of Polymers had prepared a document on "Glass transition of atactic polystyrene" and had initiated a project on "Crystallization and melting of LLDPE".



Analytical Chemistry Division

In his biennial report, Analytical Chemistry Division President, Prof. George Nancollas informed Council that the following possible division intercommissional projects were under consideration:

- Mathematical treatment of analytical data (chemometrics).
- Atmospheric pollution.
- Analytical chemistry in biotechnology.
- Separations sciences.

The Analytical Division Committee has been encouraging the development of databases within the Commission on Equilibrium Data and the Commission on Solubility Data. It was also felt that the division should embark on the important application of biotechnology to the development of diagnostic reagents. Recommendations regarding quality control in these biological techniques are most important in assessing the reliability of the analytical methods in diagnostic applications.

The Commission on Analytical Reactions and Reagents had published two reports since Lyon: "Quantitative characterization of procedures using UV–VIS molecular absorption spectrophotometry" and "Characterization of liquid stationary phases and column extraction procedures for gas chromatography". Five other reports are in preparation. The commission confirmed its wish to remain prime movers of a separations science programme.

The Commission on Microchemical Techniques and Trace Analysis is concerned with (i) micro- and surface analysis, (ii) inorganic trace analysis and (iii) organic trace analysis. Speciation studies of trace elements provide a means of following the fate of elements in the environment and to assess, more accurately, possible toxicological effects. Speciation schemes can also be of considerable importance in the estimation of environmental impact of waste deposits.

The commission published five reports on these topics during the biennium and a further eight are in preparation.

The Commission on Analytical Nomenclature had to contend with relatively lengthy approval processes for nomenclature reports. The division is considering methods for speeding up this multiple review process which, for some projects, has been

inordinately extended. Some 11 reports are in advanced stages of review.

Concerning the Commission on Spectrochemical and Other Optical Procedures for Analysis, Nancollas reported that work is continuing on the preparation of indexes and translations of *Nomenclature, symbols, units, and their usage in spectrochemical analysis*.

Since the Lyon General Assembly the Commission on Electroanalytical Chemistry has published seven reports. A further three are in press and two are under review. The commission has proposed projects on: Voltammetric micro-electrodes; Sensitivities of anodic stripping voltammetric techniques; Analytical conductometric titration of polyelectrolytes; Oxide reference electrodes; pH standards; Bio-sensors; and Chemometrics in electroanalysis.

Prof. George Nancollas: "The Analytical Division should embark on the important application of biotechnology to the development of diagnostic reagents".

The two main projects of the Commission on Equilibrium Data are proceeding to plan: "The compilation of stability constants" and "The Critical evaluation of stability constant data". Possible new projects include:

- Critical evaluation of stability constants in seawater.
- Stability constants for solid/liquid adsorption equilibria.
- Critical evaluation of stability constants determined in molten salts.

The interdivisional Commission on Radiochemistry and Nuclear Techniques has circulated papers dealing with "Online radiometry in high performance liquid chromatography using a storage loop". A report on sources of information for radiochemistry and nuclear techniques was also submitted for review at Boston.

The Commission on Solubility Data has produced four volumes of critically evaluated data and a further four were in press. The Subcommittee on Gas Solubilities has collected 560 data and evaluation sheets on hydrogen halides in non-aqueous solvents and a volume of some 340 pages dealing with hydrogen sulfide and hydrogen selenide is in preparation.

The commission has completed reports on hydrocarbons in water and seawater and the project dealing with silver, copper and gold salts is almost complete. At Boston, the commission discussed the initiation of several new projects including ethene, scandium, yttrium, lanthanum, lanthanide sulfates and chlorides, ammonium and alkaline metal perchlorates, solubilities in alcohols, and alkali metal alkanoates.

Applied Chemistry Division

Applied Chemistry Division President Dr Phil Kearney reported that since the last general assembly the Commission on Food Chemistry had submitted 13 new projects for approval. The majority of these dealt with the measurement of toxic substances (nitrosamines) in foods.

IUPAC publishers Blackwell Scientific Publications mounted a display at the assembly. It included IUPAC publications such as *Pesticide Science and Biotechnology*.

Two important new topics were animal drugs and immunoassays. Immunoassays hold considerable promise as a detection method since they are sensitive, selective and inexpensive when compared to current methodologies.

To accelerate the activities of the Commission on Biotechnology, meetings were held in 1986 at Eberswalde (GDR) and in 1987 in Basle (Switzerland). From these meetings the commission developed a paper on its terms of reference and five projects.

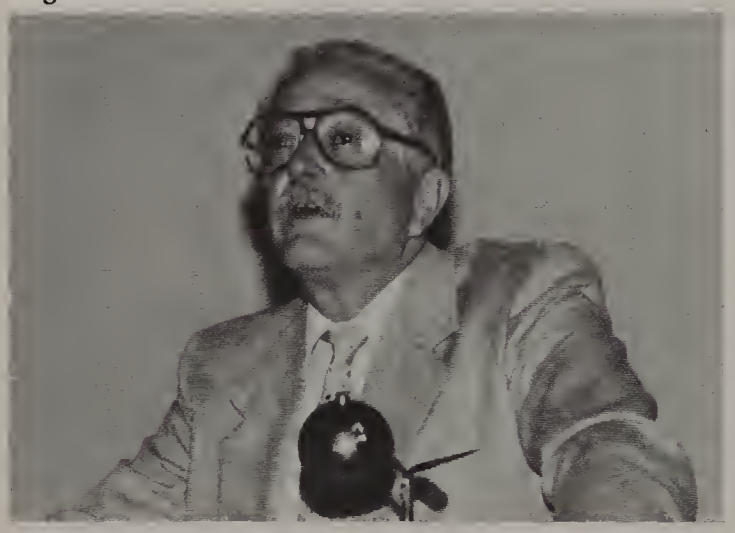
A computer-based glossary, consisting of 2700 selected key words is being prepared by the commission. Another project on the inter-relation of biotechnology and organic chemistry is in preparation. This shows how certain biotransformations can be of assistance to the organic chemist.

Four feasibility studies have been started: Guidelines for biotechnology; Reactions enhanced by genetic engineering; Biophysical chemistry; and

Biotechnology symposium

A symposium entitled "Biotechnology in chemistry: role in agriculture, chemical industry, pharmaceutical industry and energy and the environment" was held during the 34th IUPAC General Assembly in Boston on 22 August 1987.

The symposium was attended by 100 chemists — not only IUPAC members but also faculty and students of a number of local institutions such as Harvard University, Boston University and Massachusetts Institute of Technology (MIT) as well as representatives from local organizations.



Dr Arnold Demain (MIT) discussed the role of biotechnology in the pharmaceutical industry: "What is true for *E. coli* is also true for the elephant — only more so".

The symposium was organized by the Commission on Biotechnology (VI.2) and chaired by Applied Chemistry Division President Dr Philip Kearney who introduced the speakers. Dr Manfred Ringpfeil, Chairman of Commission VI.2 opened the meeting by discussing the purpose of the symposium.

Dr Roy Chalef of E.I. du Pont & Company then presented a lecture on the role of biotechnology in plant protection and growth. This was followed by a lecture on the role of biotechnology in chemical industry by Dr Heinz Kölbl, a group leader at Bayer AG and commission member. Kölbl emphasized the role of stereo-specific reactions catalysed by microbial enzymes.

Dr Arnold Demain of MIT gave a presentation on the role of biotechnology in the pharmaceutical industry, detailing the recent accomplishments on the impact of recombinant DNA technology in pharmaceutical development. Finally, Dr Anand Chakrabarty of the University of Illinois, and commission member, lectured on the role of biotechnology in the energy sector as well as on the alleviation of problems of toxic chemical pollution in the environment.

Anand Chakrabarty

Methods for the characterization of anaerobic bacteria.

The Commission on Oils, Fats and Derivatives has 15 projects in progress. Four projects have been published in *PAC* and the 7th edition of "Methods" was published in February 1987.

The major thrust of the Commission on Atmospheric Chemistry will be tropospheric chemistry. The chairman, Dr Jack Calvert, has prepared an extensive *Glossary of terms in atmospheric chemistry*. This is currently under review and should be published soon. An international *Inventory of current tropospheric sampling programs* is also in progress.

The Commission on Pesticide Chemistry has nine current projects. A book entitled *Pesticide Science and Biotechnology* containing presentations at the International Congress of Pesticide Chemistry, Ottawa, Canada, September 1986 was published in 1987. The following two commission documents have been published:

- Interpretation and optimum use of residue data.
- Application of multi-residue procedures in pesticide residue analysis.

A book entitled *Recommended approach to the validation of animal metabolism in relation to man* is soon to be published. This is a treatise on the comparative biochemistry of pesticide metabolism and includes several hundred reactions and pathways. Another project entitled "Recommended approach to the evaluation of the environmental behaviour of pesticides" is ready for publication.

Kearney finally reported that the Commission on Water Chemistry has published the proceedings of a workshop entitled *Removal of chlorinated hydrocarbons and heavy metals from waste waters by advanced treatment systems*. The commission also sponsored a conference in Israel on "The fate of pollutants in the unsaturated zone". Two feasibility studies on "Treatability tests" (which deal with chemically destroying pollutants in waste water) and "Leaching tests" (which deals with pollutant movement in landfills) are under investigation.

Clinical Chemistry Division

In his report to Council, Clinical Chemistry Division President Dr Stan Brown pointed out that, with regard to the Commission on Automation and Clinical Chemical Techniques, genetically engineered probe reagents are rapidly opening up new methods for the chemical analysis of body tissues, and hence for clinical diagnosis. Systematic nomenclature in this area needs to be developed, as one part of the broad field of biotechnology nomenclature. There is much work to be done, and the commission is happy to collaborate

with the Applied Chemistry Division in these efforts.

Turning to the Commission on Quantities and Units, Brown stated that there are plans to tackle difficult problems of quantities and units in new fields, including electrophoretic and electrochemical techniques. As with past projects, it is expected that there will be special cooperation with the Interdivisional Committee on Nomenclature and Symbols (IDCNS) and that opportunities will arise for input to technical commissions of the International Organization for Standardization (ISO).

The Commission on Teaching is required to complete its outstanding projects during 1988. At the end of that time, it is proposed that new projects — some of which are likely to cross boundaries with other IUPAC divisions — should be coordinated by a subcommittee of the division committee, working in conjunction with the Committee on Teaching of Chemistry (CTC). The importance of enlarging the scope of this committee has already been stressed by Prof. Rao.

The second phase of the restructuring of the Commission on Toxicology has been completed, with the consolidation of the work of the selenium and cadmium subcommittees into new subcommittees with broader terms of reference. A good start was made on a joint project on lithium with the Inorganic Chemistry Division. Aspects of chemical safety and risk assessment are now considered to be viable long-tern projects for the commission.

Commission & Committee News

Chemical databases

The Meeting of the Committee on Chemical Databases (CCDB) at the Boston General Assembly was its first and as such most of the effort of the committee was spent on interacting with various commissions. CCDB members visited some 15 different commissions, divisions and committees during the general assembly. Contact with other IUPAC bodies will take place by mail and at the next general assembly meeting in Lund, Sweden in 1989. Members of CCDB spoke with these groups about the purpose of this new IUPAC standing committee which might be more accurately described as a "moving committee".

Two articles about computers and chemistry appeared in the July, 1987 issue of *CI*. The committee agreed to submit to *CI* one article each year for the remainder of the decade in order to help increase the awareness and understanding of IUPAC members and affiliates of the broad use and impact of computers in chemistry. The committee is also preparing a *Glossary of Computer Terms for Chemists* for publication in 1988 and also *Guidelines for Database Design*. The latter will be made available to IUPAC groups involved in database work.

CCDB is working with various IUPAC commissions to assist their computerization of database activities. However, CCDB does not become involved with the scientific content of a commission project. The committee has received one database on *"Enthalpies of Vaporization"* created by

Stephen Heller, coordinator of a "Moving Committee" on chemical databases.

V. Majer of the Commission on Thermodynamics (I.2). This is expected to be made available in 1988. Other databases, which will follow soon after, will be in the fields of conductance and pesticide properties.

All of these databases will be made available on IBM PC compatible floppy disks, with search programs to search, retrieve and manipulate the databases. Industry standard nine-track tapes of the database alone will also be available and the databases are to be made available to online computer vendors for additional dissemination.

CCDB brought a portable computer with a built-in 20 MB hard disk to the general assembly to assist in the demonstration of the prototype of the Commission V.8 *Solubility Database* and the *Enthalpies of Vaporization* database. Both demonstrations were well received.

CCDB will meet again in South Tyrol, Austria, in May 1988.

Reference materials

According to the terms of reference for the Subcommittee on Reference Materials contact was established with all divisions of IUPAC at the Boston General Assembly. One representative was appointed by each division president to provide liaison with the subcommittee.

These appointees attended a meeting of the subcommittee at which its aims and objectives were described and means of future communication were discussed. Members of the subcommittee also attended meetings of several commissions with a potential interest in reference materials.

As a result of these discussions, the need for cooperation in the field of reference materials between IUPAC bodies and between IUPAC and other international organizations was demonstrated.

Approximately 30 participants at the general assembly observed a demonstration of a new computer database which is useful in locating sources of reference materials for a specific use.

Each commission has been requested to survey the status of reference materials in its field and to inform the subcommittee of such status and future needs.

The next meeting of the subcommittee will be held in Geneva, Switzerland, 7–9 October 1987.

A. J. Head

New edition of 'Green Book'

The second printed proofs of the new 'Green Book' were presented to the Commission on Physicochemical Symbols, Terminology and Units (I.1) at its Boston meeting. A commission task group consisting of T. Cvitaš, K. Homann, N. Kallay, K. Kuchitsu and I. Mills (Chairman) had been working on the book since the Lyngby meeting in 1983.

Professor Mills reported on the new concept of the book which has no longer the character of a legal document, full of rules and conventions, but that of a manual of advice and assistance for daily use with physicochemical and general chemical literature.

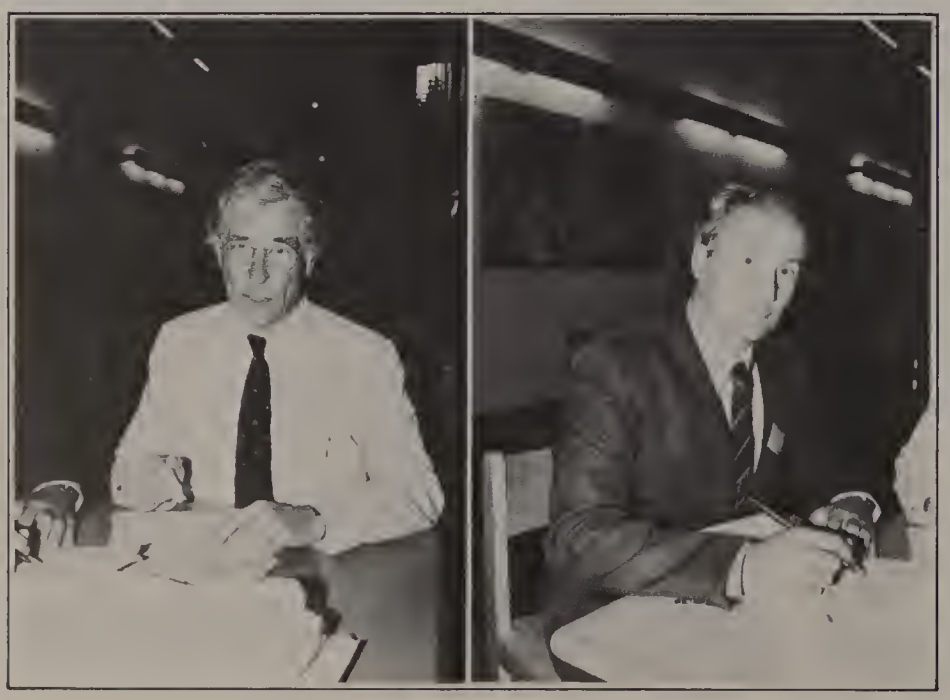
Being the successor of previous editions of the 'Green Book' it will appear under the slightly altered title: *Quantities, Units and Symbols in Physical Chemistry*. The book will have largely extended contents, including useful conversion tables of units, the most recent values of the fundamental constants and many examples of quantity calculus.

The manuscript has been sent to many experts in different fields of physical chemistry. This has led to an intense exchange of ideas and suggestions providing the basis for a broad acceptance in the community of physical chemists and generally in the field of chemistry. In this sense it was finally discussed and 'polished' at Boston in two joint sessions with the Commissions on Thermodynamics (I.2) and Molecular Structure and Spectroscopy (I.5).

All those interested are invited to send comments on the new 'Green Book' after its publication.

The commission has invited members of other IUPAC commissions and all who are interested in the work of Commission I.1 to continue to correspond and send comments after the appearance of the new 'Green Book' so that Commission I.1 has a basis for its continuing project of revision of this document.

Work in this field of symbols and nomenclature is never complete and has to keep up with modern



Tom Cvitaš (Secretary, right) and Ian Mills (Chairman, left) of the Commission on Physicochemical Symbols, Terminology and Units (I.1) at Boston.

developments. Therefore, a new but related project of 'Symbols for quantities and units for computer use' has been initiated.

The next commission meeting is scheduled for 1989 during the Lund general assembly.

K. H. Homann

Improved determination of water viscosity

The meeting of the Subcommittee on Transport Properties of the Commission on Thermodynamics (I.2) was attended by 16 members and some 14 continuing projects were described and discussed. Among them was one of the projects begun five years ago in Lyngby. Professor Øye from Norway described his work on an improved determination of the viscosity of water under saturation conditions around room temperature. Because water is the fundamental reference material for all viscometry this new determination with an improved accuracy is highly significant.

As part of a project on the representation of the transport properties of carbon dioxide over a wide range of thermodynamic states, Professor Sengers of the USA described a new theoretical treatment of the enhancement of the viscosity and thermal conductivity of pure fluids. This is to be included in a global representation of both properties currently being prepared for publication. Within the descriptions of this project and several others, it was noted that the available experimental information was neither as extensive nor as accurate as was required by the chemical industry. For these reasons a considerable use of theory was necessary to fill the missing regions. Further examples of the use of appropriate statistical mechanical theory were discussed in the context of alkali metal vapours and test mixtures for distillation.

A new project likely to be initiated was the preparation, under the auspices of Commission I.2, of a volume concerning experimental methods of transport property measurements. The subcommittee gave total support to the new project and an editorial board was selected pending project approval. A two-year time-scale for completion of a first draft was envisaged.

The next meeting of the subcommittee will be held in Washington DC, USA, 24–25 June 1988.

W. A. Wakeham

Evaluation of kinetic data for atmospheric chemistry

The second meeting of the newly established Commission on Chemical Kinetics (I.4) was held in Boston.

The commission learnt that the Subcommittee on Gas Kinetic Data Evaluation for Atmospheric Chemistry is preparing a critical evaluation of nearly 300 elementary reactions involved in atmospheric chemistry. Publication of this report is planned for 1988 in the *Journal of Physics Chemical Reference Data*. It will be further extended by coordinating it with existing databases.

The Subcommittee on Symbolism and Terminology in Chemical Kinetics submitted three reports to the commission. The first one is a *Glossary of Terms Used in Chemical Kinetics Including Reaction Dynamics*. This draft has still to be revised and discussed before being published.

The second report written is concerned with the problem of the rate-controlling step in a system of composite reactions. This is a very important concept about which every chemist has an intuitive feeling but which is very difficult to specify in a general and quantitative manner. Significant progress was made in the understanding of this notion during the meeting, although controversial and alternative approaches were presented. A final report should be prepared on the basis of the Boston discussion for the next meeting.

The third report on "Kinetics in open flow systems and composite reactions" was approved by the commission, provided that it is extended to include complementary material discussed during the meeting. This should lead to a publication in the course of 1988.

The commission also discussed a report presented by Dr Flynn of the International Confederation for Thermal Analysis. The interpretation of kinetic data from thermal analysis could constitute a future project of the commission.

Simultaneously, useful meetings were held with other commissions with a view to exchanging information and establishing cooperation in various areas such as catalysis, electrochemistry, atmospheric chemistry, organic physical chemistry, photochemistry, computer databases and biophysical chemistry . . . where chemical kinetics is actually involved.

The next meeting of the commission will be held in Lund, Sweden in 1989.

Prof. Jacques Villerman

New subcommittee on "thin films"

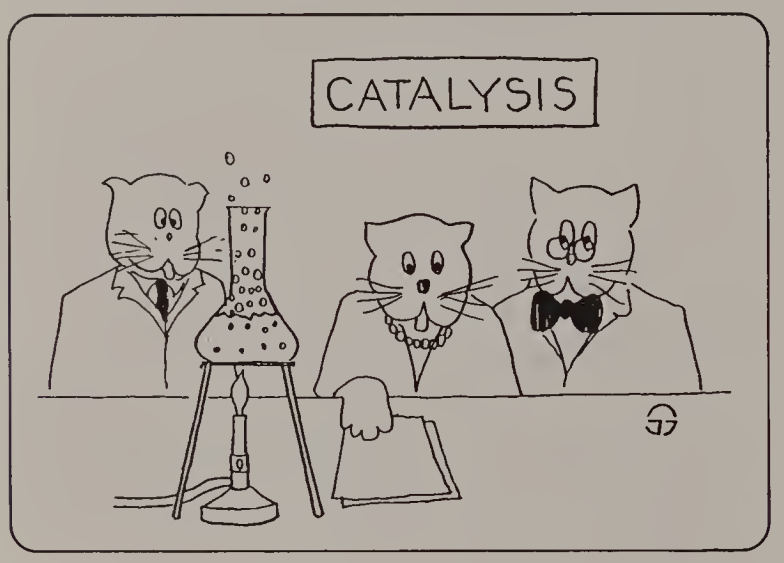
A number of IUPAC-sponsored conferences concerned with the broad subject area of the Commission on Surface and Colloid Chemistry including Catalysis (I.6) were held during the two-year period prior to the Boston General Assembly.

In addition to the IUPAC congresses in Manchester (UK, 1985) and Sofia (Bulgaria, 1987) there has been the 7th International Conference on Zeolites

in August 1986 in Tokyo and a meeting on Porous Solids in April 1987 in Frankfurt. Favourable reports on each of these meetings were received from commission members who had participated.

Of the current projects being undertaken by the commission, several are nearing completion and will be shortly ready to send to experts in the field for review. These include:

- Experimental techniques in surface chemical physics (joint project with Commission on Molecular Structure and Spectroscopy).
- Catalyst characterization. This project is now split into two sections: terminology and methodology.
- Electrified interfaces.



The Subcommittee on Porous Solids will meet again in Brussels in the Summer of 1988 to finalize work and prepare a provisional report for the 1989 general assembly.

Good progress has been made on the report on "Phase equilibria in surfactant systems" although further detailed work is required. Hopefully, this will be completed by 1989.

The report of the working party on "Thin films" was favourably received and a new subcommittee under the chairmanship of Dr L. Terminassian-Seraga is to be established. Its objective will be to review the terminology and methodology in this very important and expanding field. This will cover not only the more traditional so-called "fluid thin films" but also the more recent "solid thin films".

The commission is also actively involved with the general work of the Physical Chemistry Division in the areas of "The use of abbreviations in surface science" and "The Working Party on Biophysical Chemistry".

In view of the large number of tasks currently being carried out by the commission, it was decided not to initiate any new ventures during the next two years. However, several topics were discussed for possible consideration at the 1989 general assembly.

Finally, the terms of reference of the commission were discussed in detail and it was agreed to submit a revised form of these which would be more in line with current work and philosophy of the group.

The next meeting of the commission will be held in Lund, Sweden, August 1989.

B. Vincent

Activity beyond our planet

When the Inorganic Chemistry Division Committee met in Boston it reviewed the activities of its three commissions.

An endeavour which has occupied the energies of the Commission on Nomenclature of Inorganic Chemistry (II.2) has been successfully concluded. Part I of the 'Red Book' on the nomenclature of inorganic compounds has passed all hurdles. It was scheduled to be submitted to the publisher by the end of 1987 and should be in the hands of the scientific community by September 1988.

The more specialized Part II of the 'Red Book' is in preparation. Several chapters are finished and others are in various stages of formation. Finalization of the volume is anticipated in about five years. The somewhat controversial renumbering of the groups in the Periodic Table of the elements used in Part I will be published separately in *PAC* to test its acceptance by chemists all over the world.

Extra-terrestrial materials

The Commission on Atomic Weights and Isotopic Abundances (II.1) has embarked on a new venture and envisages publication of a revised table of isotopic compositions of the elements by the end of this decade. Not satisfied with terrestrial confines, this commission has extended its field of activity beyond our planet. The study of isotopic abundances in extra-terrestrial materials has proved to be of great interest to geochemists, geophysicists and cosmochemists. New tables of atomic weights to four and five significant figures are in preparation.

A problem of considerable interest is the lack of reference values for specific elements in clinically and toxicologically important samples. Inter-laboratory tests have revealed a considerable but unacceptable spread of data. The Inorganic Chemistry Division has spearheaded an interdivisional project to establish reliable reference values by isotopic ratio measurements. First results have been very encouraging and an extension of the project involving also the Clinical Chemistry Division has received unanimous support by the committee.

Far-flung experimental activities

The far-flung and numerous experimental activities of the Commission on High Temperature and Solid

State Chemistry (II.3) have made a very favourable impression on committee members. The project on high temperature mass spectrometric ion cross-sections has passed the exploratory stage, and a first report should reach specialists in 1988. Multi-laboratory tests on the microanalysis of glass samples and on the ionic conductivity of fluoride-type solids have commenced, and results will be presented to interested scientists.

Interdivisional projects on the role of inorganic chemistry in biotechnology, and on teaching of solid state chemistry have received approval by the committee.

The next meeting of the division officers will be held in London, UK in September 1988. The division committee will meet in Lund at the next general assembly.

K. L. Komarek

Red Book Part II takes shape

The Commission on Nomenclature of Inorganic Chemistry (II.2) met in Boston from 17 to 23 August 1987. For the first time Part II of the Red Book dominated the work of the commission.

Part of the meeting was dedicated to the last minor revisions of the different chapters of the Red Book Part I, in response to comments received from IDCNS (Interdivisional Committee on Nomenclature and Symbols) and from the public through regional centres. Instructions were also given to the editor about the final presentation of the book. Details of the formats of the Periodic Table of the Elements that are to appear in the book were defined. The primary display of the table will be as a frontispiece, where it will appear as the 18-column table with the columns numbered 1 to 18. Three commonly used versions of the table will appear in an appendix, where the commission's position on the widely debated subject will be stated. It was also decided that a document similar to the appendix will appear as a separate publication in chemistry journals for the purpose of providing public information prior to the publication of the Red Book Part I itself. The final manuscript will be with the publisher in 1988 and the book is expected to appear in print during the autumn of the same year.

Red Book Part II is beginning to merge and take shape. Three chapters are now ready: Hydrides of nitrogen, Isotopically modified compounds and Inorganic coordination polymers (written jointly with the Macromolecular Commission). The fourth chapter, Nomenclature of polyanions, was recently sent for publication in *PAC*. A fifth chapter, Nomenclature of inorganic rings and chain compounds, was definitively approved during this meeting and is now ready to go to referees.

During an interlude in their Boston General Assembly meeting, the Commissions on Nomenclature of Inorganic Chemistry (CNIC) and Organic Chemistry (CNOC) toured some places of historic interest near Boston. These included Lexington, Concord and Stourbridge.

On the left, CNIC and CNOC members hold informal discussions during lunch on the trip and on the right they gaze at the Statue of the Minute-Man in the Minute-Man National Historical Park, Concord. The park is the site of the Concord Fight on April 19th, 1775. The statue marks the spot where the first shot was fired between the British Redcoats and the Concord Militia. The militia were called minute-men because they were "ready in a minute".

New projects were defined and working parties were set to deal with them. Some of these are: Use of nodal nomenclature in inorganic chemistry, Nomenclature of group 14 organometallic compounds, and Nomenclature of organometallic cluster compounds.

A newsletter was published in 1987 in three journals. This series is being well received and it was decided to continue this practice in the future.

A joint meeting with CNOC (Commission on Nomenclature of Organic Chemistry) was held and several working parties convened to discuss points of common interest.

The next meeting of Commission II.2 is scheduled for 1–7 August 1988 in Helsinki, Finland.

E. Samuel

High temperature and solid state chemistry

The status of four publications was reviewed by the Commission on High Temperature and Solid State Chemistry (II.3) when it met at the Boston General Assembly.

The Bibliography on the high temperature chemistry and physics of materials was published on schedule. The purpose of this project is to publish quarterly citations to current literature in the high-temperature field.

A paper on Si_3N_4 powders was accepted for publication in *PAC*. The purpose of the project on *Classification of Si_3N_4 based materials* is to publish a classification of the silicon nitride-based materials inaccurately described as "densified silicon nitride". The project emphasizes the strong interdependence of chemical composition, phase diagram type, microstructures, and properties of the materials.

High temperature discussions: Commission II.3 at Boston.

A project on *Properties of silicon nitrides powders* aims to publish a view of the measurements and standardization of silicon nitride powders, including the ratio of α- to β-modifications, the content of elemental silicon, the adherent SiO_2, and the determination of grain shape, grain size, grain size distribution, and specific surface.

The Red Book Part II chapter on "Nomenclature of graphite intercalation compounds" was preliminarily published and comments received. The purpose of this project is to provide a consistent and internationally accepted terminology and nomenclature for graphite-intercalation compounds.

A paper on the melting points of oxides was completed. The aim of the project on *Melting points of refractory oxides* is to publish recommended melting points, with uncertainties, for those oxides for which literature values are seemingly sufficiently concordant. These are the oxides of groups II, III, IV and the rare earths.

Other projects discussed by the commission included:

- Carbide-graphite secondary temperature standards.
- High-temperature mass spectrometric ionization cross-sections.
- Reference electrodes for high-temperature solid state EMF studies.
- Phase transition terminology.
- Ionic conductivity of fluorite structure solids.
- High-temperature thermochemical data of the elements.
- Recommended procedures for microanalysis of glasses.
- Terminology and characterization of carbon.
- Reassessment of the *High temperature bibliography*.
- Teaching of solid state chemistry.
- Properties of SiC powders.

Paul W. Gilles

Three new Organic Chemistry Division initiatives

The Organic Chemistry Division Committee undertook three new initiatives at its meeting at the Boston General Assembly.

First, the division formed a "think tank". This is a special committee which aims to suggest opportu-

Prof. Irine P. Beletskaya, Secretary of the Organic Chemistry Division Committee at the Boston General Assembly.

nities for future activities. A "brainstorming" session of the think tank was planned for Autumn 1987.

Second, the division committee decided to meet every year instead of every second year. The aim of this initiative was to enable members to become more quickly involved in division affairs.

Finally, the division is forming a special task force to define guidelines for the work of the Commission on Nomenclature of Organic Chemistry (III.1) in the 1990s. This commission has received numerous requests concerning nomenclature problems and desires help in setting priorities. The need for traditional names for complex organic structures has been questioned following the development of modern computer systems which can provide information on chemical structures. The task force will report to the division committee by January 1989.

Irine P. Beletskaya

The end of the first chapter

Since the Commission on Physical Organic Chemistry (III.2) was established, three projects have dominated its work. The first was the *Glossary of Terms Used in Physical Organic Chemistry*, initiated by the late Professor Gold and now incorporated into the appropriately named *Gold Book* (see *CI*, Vol. 9, No. 5, p. 189, 1987). The other two concerned the nomenclature of organic chemical transformations and methods of symbolizing reaction mechanisms. Three papers on these topics were finalized at Boston and publication is expected in 1988.

The commission also finalized a short paper on naming hydrogen in situations where it is necessary to distinguish between the ^{1}H isotope specifically and hydrogen in natural or unspecified abundance.

A set of guidelines for good publication practice in physical organic chemistry is at an advanced stage of development and will probably be completed before the commission's meeting in Regensburg in 1988.

The commission has several other projects in early stages or under study for their feasibility. These include guidelines for quantum chemical and computational publications, a list of class names of reactive intermediates, a critical evaluation of the physical properties of reactive intermediates, and the definition and evaluation of structure–reactivity parameters. A revision and extension of the commission's glossary, which was set back by Professor Gold's untimely death, is now under way.

During the general assembly, meetings were held of the joint working parties (with III.1) on stereochemical terminology and on class names. The commission met with Commissions I.4 and III.3 to exchange information and to arrange cooperation in several activities.

The commission records its gratitude to Bob Guthrie, John Littler and Jerry March, all of whom have been chairmen of working parties for many years, as they come to the end of their membership.

Richard A. Y. Jones

Reference materials for fluorescence measurements

When it met at the Boston General Assembly the Commission on Photochemistry (III.3) finalized the title document which includes reference compounds to be used for the determination of fluorescence lifetimes and quantum yields.

A critical compilation of chemical actinometers to be used for the determination of quantum yields of photochemical reactions has also been completed and is ready for publication. Both documents will now be submitted to the Organic Chemistry Division for approval.

A collection of descriptions of experiments in photochemistry organized by their degree of difficulty has been compiled. This is intended as an aid in undergraduate-level teaching and will be published in *PAC*.

Joint meetings with the Commissions on Physical Organic Chemistry (III.2) and Chemical Kinetics (I.4) served to exchange ideas about the projects under way in each commission. Several subjects of common interest were identified and joint efforts have been planned. Examples are the project on "Properties of Transient Species" between Commissions III.2 and III.3 and the *Glossary of Terms on Chemical Kinetics* between Commissions I.4 and III.3.

The next meeting will be held in Bologna, Italy, in July 1988 on the occasion of the 12th IUPAC-sponsored Symposium on Photochemistry.

Silvia E. Braslavsky

Liquid crystal polymers

A project on liquid crystal polymers was one of the three new activities initiated by the Commission on Polymer Characterization and Properties (IV.2) when it met at Boston last August. The other two new projects are on modelling polymerization kinetics and polymer networks.

The Working Party on Structure and Properties of Commercial Polymers continues its collaborative experimental work on two major programmes:

- Continuous carbon fibre composites, including liquid crystal polymers now available commercially, both with unique mechanical properties.

- Fundamental study of the blending and alloying of a pair of basically incompatible polymers.

In addition, there are four projects underway in the East Asia sub-group (which now includes members from China and Korea) and one in the East European sub-group. Four major projects have been recently completed and seven publications have been produced over the last year.

The commission has decided to terminate the Working Party on Supported Polymer Films.

Collaborative work on the glass transition of polystyrene and the crystallization and melting processes of linear low-density polyethylene is being successfully pursued by the Working Party on Thermal Properties of Polymers. This working party has world-wide membership and a good balance between industry and academe. The transition behaviour of liquid crystal polymers is being considered for a future project.

The recently formed Working Party on Interactions of Polymers with Living Systems has already progressed to the first stages of two projects. One is to create new definitions of the blood compatability of polymers as a function of a set of parameters reflecting interactions between the polymers and the blood. The other will compare data from assay networks and reference materials to establish standard procedures and to test in real circumstances the definitions deriving from the other project.

The three new working parties have all already had active discussions from which they can move forward with confidence. The Working Party on Modelling of Polymerization Kinetics and Processes arises from needs seen by a previous experimentally based working party of the commission. It is establishing two complementary projects, one considering models based on elementary reactions and the other modelling polymerization processes in reactors from an engineering viewpoint.

The new Working Party on Polymer Liquid Crystals has fully formulated objectives.

- to standardize characterization methods and terminology;
- to elucidate morphology, and
- to evaluate and establish new methods of characterization to clarify the liquid crystal state of polymers.

The initial programme will concentrate on thermotropic, main chain polymer liquid crystals — primarily polyesters.

A proposal was made to establish a Working Party on Polymer Networks. This suggested investigation and definition of relationships between the structure and properties of well-defined polymer networks, and the conditions and mechanisms of formation. The two main areas of study will be covalent networks of defined structures and model physical, reversible gels from natural and synthetic polymers. The commission welcomed this proposal warmly.

John M. Cann

Analytical chemistry

The various activities of Division V commissions were reviewed by the Analytical Chemistry Division when it met in Boston. Advance copies of the new edition of the "Orange Book" — *Compendium of Analytical Nomenclature* — were displayed at the assembly. A book on the determination of trace elements in natural waters is about to be published.

The "harmonization" working party completed its first publication on harmonization requirements for the design, conduct and interpretation of collaborative studies. This is a joint effort of Divisions V, VI and VII. The working party is now continuing its activities in two directions, one on quality assurance systems and the other on the adoption and presentation of standardized methods. These projects are, as in the case of the first one, carried out with organizations outside IUPAC, such as ISO (International Organization for Standardization) and AOAC (Association of Official Analytical Chemists).

The scope of the work of the Subcommittee on Electroanalytical Methods of Environmental Trace Analysis, formerly a subcommittee of the Commission on Electroanalytical Chemistry (V.5), has been enlarged. The subcommittee will in the future operate with a membership also comprising people from other divisions and commissions and again people from outside IUPAC. A completely new programme has been written which will start in the next biennium with a number of projects on problems arising in the environmental analytical chemistry of air, water, sediments and soil. This subcommittee is now operating directly under the division committee.

During the general assembly there was a general feeling that, in addition to the work of the commissions of the division, problem-oriented projects will in the future play an important role in the work of the division.

It was decided at the assembly, that chromatography should in the future play an important role in the work of the Commission on Analytical Reactions and Reagents (V.1). Hence the name of the commission, its terms of reference, its membership and its programme were modified accordingly.

G. den Boef

Emphasis on analytical separations

At the Boston General Assembly the Commission on Analytical Reactions and Reagents (V.1) was

pleased with the Division Committee's formal review of activities and progress. The commission willingly accepted the suggestion to enhance its profile in analytical separations to focus and spearhead the Division's efforts in this key area. It thus requested the formation of a new working group on analytical separations.

The initial effort will be in chromatography although all separation methods are within the proposed scope. This is the second special working group within the commission, the now active chemometrics group having been set up at the general assembly in Lyon.

Work on the traditional areas continued and reports were finalized in the 'organic' analytical reagents project, classification of interferences and metal buffers.

Three reports have been published since Lyon and two await division committee approval. A new area for the commission within the biotechnology theme was established via a new project on classification and characterization of immobilized enzymes for analytical purposes, under our new associate member P. Worsfold, who at the age of 33 is suitably young and therefore in keeping with the new principles for membership of IUPAC.

The next meeting of the commission will be held in Freiberg, GDR in late August 1988.

D. Thorburn Burns

The Analytical Reactions and Reagents Commission at the Boston General Assembly.

New subcommittee on environmental analytical chemistry

An *ad hoc* Subcommittee on Environmental Analytical Chemistry was created by the Analytical Chemistry Division at the Boston General Assembly. The subcommittee has a flexible structure in order to cope with the multidisciplinary character of environmental problems.

The subcommittee's projects will be concerned

The new subcommittee on environmental analytical chemistry will be concerned with environmental problems of the atmosphere; sea water; fresh waters and sediments; and soils. (Photo: Clew Bay, Co. Mayo, Ireland.)

with environmental problems on a global scale and will be grouped into four distinct categories: atmosphere; sea water; fresh waters and sediments; and soils.

All projects aim to:

- identify factors which control the state and dynamics of each environment as well as its physico-chemical parameters;
- compile numerical values for each parameter;
- critically evaluate and standardize current methodologies of measurement;
- develop standardized procedures to validate experimental data and interpret them in terms of well established physico-chemical parameters;
- pin-point future methodological needs.

J. Buffle

Microchemical techniques and trace analysis

The most important work to be undertaken by the Commission on Microchemical Techniques and Trace Analysis (V.2) in the future will be on research on surface-analytical methods and on a series of critical reviews on speciation.

The first topic will form the basis of a workshop in Argenne, USA in 1988. The series of critical reviews will be particularly concerned with metal organic complexes and the importance of their measurement at the trace level in the environmental and biomedical field.

This long-term programme has been planned to guide the work of the commission during the following four- to six-year period. Two preliminary studies have demonstrated the need for the work on speciation.

Four new projects on surface analysis are planned including:

- Critical evaluation of MeV ions for surface analysis.

- The determination of the depth of origin of spluttered atoms and molecules.
- The effects of radiation on chemistry in the solid state and the preparation of biological samples for ion microscopy.

These are all exciting and important studies on the appreciation of analytical microchemical techniques to surface analysis.

The group working on organic trace analysis have divided the programme into two main areas. The first is concerned with analytical techniques for trace organic compounds where the application of combined techniques will be critically evaluated with a view to usefulness, expense, ease and range of operation. Then more specific reports such as the application of tandem mass spectrometry in trace organic analysis will be prepared.

In parallel with this a series of critical reviews on analytical methods for specific organic compound classes will be made. Two areas are currently being reviewed. One is on halogenated phenolics with particular reference to their impact in our environment and the need for reliable methods at the ultra-trace level. The other covers microtrace analysis of modified nucleosides in DNA. This has particular application to the biomedical field and covers an alternative approach to understanding of the impact of xenobiotics on DNA.

For the future, the experience of the inorganic and organic arms of the commission along with new specialists in the field of speciation will be combined to prepare a feasibility report of the state of the art in this rapidly developing and important field of study.

The commission have planned a series of working group meetings on both organic trace analysis and speciation during 1988. The commission will meet in Dortmund, FRG in July 1988.

D. E. Wells

Computer database for stability constants

Critical surveys of stability constants were reviewed at the Boston meeting of the Commission on Equilibrium Data (V.6). These included surveys on cyano complexes and thiocyanato complexes. Surveys on amino acid, hydroxycarboxylic acid, carbonate, and halo complexes were organized.

Other projects accepted by the commission included:

- A seven-chapter manuscript on complex equilibria with organic polyelectrolytes. This was recommended for publication as a book.
- A recommended procedure for testing apparatus for pH-metric determination of stability constants.
- A recommended standard format for publishing stability constants.

The collection of stability constants was discussed further and computer storage and dissemination considered. A computer database has been initiated in Stockholm. This produces camera-ready copies. Plans to transfer the database to a micro-computer were discussed.

New projects considered included two on equilibria in sea water; a critical evaluation of equilibria in molten salts; and a paper on the determination and interpretation of micro-constants. A joint project with the Commission on Electroanalytical Chemistry (V.5) on the standardization and use of ion-selective electrodes was approved.

The next meeting of the commission will be held in Porto, Portugal during the 26th International Conference on Coordination Chemistry in August 1988.

L. D. Pettit and O. Yamauchi

Half-lives critically evaluated

The Commission on Radiochemistry and Nuclear Techniques (V.7) discussed a number of projects when it met in Boston.

The project on the critical evaluation of half-lives has resulted in the submission of a report by Dr Holden on total and spontaneous fission half-lives for uranium, plutonium, americium and curium. A paper by Prof. Adloff on half-lives of naturally occurring radionuclides is in an advanced state.

A report on online radiometry in high-performance liquid chromatography using a storage loop was also submitted for review. A collective paper on applications of nuclear analytical methods in biology and medicine is in preparation.

Prof. Foos presented a survey paper on techniques used in industry: "Industrial uses of radiations (UV, X-rays, γ-rays, electrons, ions)". It included a section on food irradiation.

Prof. Sakanoue distributed a report on "Facilities for the determination of very low level radioactivity". The paper covered mostly problems related to particle physics. Phase II of this project will emphasize the role of radiochemists and cover low level counting and radiochemical separations.

The next meeting of the commission will be held in Brighton, England on 10 July 1988.

H. R. von Gunten

Third meeting of Water Chemistry Commission

The reformed Commission on Water Chemistry (VI.6) held a successful workshop in Frankfurt, FRG in October 1986 on the removal of chlorinated

Members of the Water Chemistry Commission sample potable aqueous solutions of various concentrations (mol l^{-1}) at a reception at the Museum of Science, Boston. From left: Tony Dobbs, Lars Gunnar (Chairman) and Alan Tetlow (Secretary).

hydrocarbons and heavy metals from wastewaters by advanced treatment systems. The proceedings of the workshop have been published and are being widely circulated.

Liaison arrangements have been established with the Commission on Microchemical Techniques and Trace Analysis (V.2) and the Commission on Pesticide Chemistry (VI.5). This will prevent duplication of effort and allow exchange of relevant documents and technical data. A representative of the Commission on Water Chemistry has been appointed to COWAR. This is the International Council of Scientific Unions' (ICSU) Committee on Water Research.

The commission has agreed to collaborate with Vanderbilt University in an International Conference on Toxicity Reduction and Control in November 1988, in Nashville, Tennessee, USA. The conference will concentrate on the practicalities of toxicity measurements and the modification of treatment processes to reduce the toxicity of effluents. Relevant expert speakers are being sought.

The proceedings of the second Israeli workshop on the fate of pollutants in the unsaturated zone, held in 1987 under IUPAC auspices, will be published in book form in 1988.

The commission has maintained an involvement in joint IUPAC/ISO (International Organization for Standardization) meetings on the harmonization of analytical methodology and has commented on draft international recommendations from OIML (International Organization for Legal Metrology).

Good progress was reported on current projects. In particular a paper on concentration units in water chemistry by Dr A. J. Dobbs has been accepted for publication in *PAC*. The concepts set out in the paper of adopting amount concentration, using units of mol l^{-1}, should be drawn to the attention of regulators when setting standards, for example, in European Community directives.

Affiliate participation in the work of IUPAC

The overall aims of the IUPAC affiliate membership scheme are:

- to disseminate information about IUPAC and its activities as widely as possible;
- to maximize the participation of chemists throughout the world in the affairs of IUPAC.

Affiliates who wish to know more about the work of IUPAC in a particular specialization and who wish to become involved in this work may contact the appropriate IUPAC body directly. A list of names and addresses of chairmen and secretaries of all IUPAC commissions, committees and divisions was published in the November 1987 issue of *CI* (pages 225–232).

Affiliates can obtain copies of this list from: Dr Michael Freemantle, Affiliate Affairs Secretary, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK.

The commission agreed to cooperate, wherever possible, with ICSU and the Third World Academy of Sciences (TWAS). As a first step, 20 copies of the proceedings of the Frankfurt workshop are being sent to TWAS.

J. A. Tetlow

Clinical Chemistry Division will focus on chemistry of human health

The Clinical Chemistry Division (VII) had three meetings at the Boston General Assembly. The first concentrated on analysing activities of the past biennium, the second was an open meeting and the third dealt with plans for future work of the division's commissions and subcommittees.

The division noted with pleasure the positive appraisal which had been given to its work by President-Elect, Professor Koptyug. In the divisional review during the course of the Boston Assembly, the well-founded and effective work especially of Commissions VII.2 (Quantities and Units) and VII.3 (Teaching of Clinical Chemistry) was recognized. These activities demonstrated well the importance of clinical chemistry, as one component of chemistry today.

Three highlights of the division's activities since the Lyon General Assembly could be identified: continuing influential efforts towards introducing SI units into laboratory medicine; the production of a comprehensive set of operational guidelines for teaching clinical chemistry; and means of assessing the roles of inorganic trace elements in determining health and disease.

In the analysis of its working procedures, the

division felt that the current guidelines for divisional work leave unsettled some important operational aspects: thus the deadlines initially given to projects tend to be extended, suggesting planning deficiencies in the project proposals. Moreover, the long review procedure for draft documents at the various levels of the division is intended to be assuring of quality, but in practice there is some lack of really critical assessment, especially from national representatives. An effective referee review system is essential if best use is to be made of the resources available to the division. The various nominees of the division to other bodies also seem to need clear guidance on their roles in supporting the division's work. For these reasons, the division agreed that its current and future projects will be reviewed more critically. Division committee members, in particular, will be encouraged to use their specific expertise.

The interim plan of Past-President Schneider and his group for revising the structure and function of IUPAC was outlined and discussed. The major points were well taken by the division, recognizing the need to make best use of IUPAC's limited resources, at the same time as covering the needs of many diverse and important aspects of chemistry, both old and new. It was felt strongly that clinical chemistry, in its broadest sense, should be an integral part of IUPAC's long-term strategic planning.

Clearly, the relationship between chemistry and health was of world-wide importance. Hence the division undertook to organize a "think tank" operation so as to make recommendations in 1988 for up-to-date terms of reference and future plans for its activities. Even before this deadline, some aspects of the division's work would be reorganized; to this end, major aspects of the work during the next biennium were reviewed. Every effort should be made to complete the outstanding projects of the Commission for Automation and Clinical Chemistry Techniques and the Commission on Teaching.

The long-term projects of the Commission on Quantities and Units would be continued, and the scope of the Commission on Toxicology would be diversified, according to the new subcommittee restructuring which was initiated at Lyon in 1985; the commission's work will be extended to cover clinical chemistry aspects of the toxicology of some organic compounds.

The next meeting of the division committee will be held in conjunction with the General Assembly to be held in Lund, Sweden, in 1989. The division executive committee will meet in Bayreuth, FRG, May 1988, in conjunction with the 3rd International Conference on Biological Reference Materials.

Jorma Jarvisalo

Teaching of clinical chemistry

This report of the Commission on Teaching of Clinical Chemistry (VII.3) is devoted to the completion of current projects. No new projects are being undertaken since the work of the commission is to be terminated before the general assembly in Lund, Sweden in 1989.

The project on the preparation of a reference catalogue of audio-visual and bibliographic material for teaching clinical chemistry continues to be ongoing as more material is collected. "Guidelines for introductory teaching of clinical chemistry" has been published in the *International Newsletter on Chemical Education*. "The clinical chemist's role in laboratory safety"; "Guidelines for production of objective based syllabi for clinical chemistry"; and "Guidelines for the preparation of laboratory procedure manuals for clinical chemistry" have all been submitted for consideration for publication. "Drug effects in clinical chemistry; education aspects" is to be submitted shortly for consideration for publication.

The commission's remaining project on a syllabus for clinical chemistry training in laboratory management is still in preparation. It is expected to be completed within the next year and will then be submitted for consideration for publication. In addition the commission worked jointly with the Commission on Quantities and Units (VII.2) on a recommended protocol for the conversion to SI units. An article on this topic was published in the March 1988 issue of *CI*.

Following the general assembly in Lyon the commission embarked on a series of projects to be carried out by working groups from individual national associations. Two of these, both produced by members of the Australian Association of Clinical Biochemists, have been submitted for publication.

Much of the work of the commission will continue under the auspices of the Education Committee of the International Federation of Clinical Chemistry (IFCC). This includes the organization and management of the IFCC visiting lectureship programme. Visits to Ireland and Indonesia are being arranged for 1988.

The IFCC Mexico clinical chemistry project has now nearly reached completion and plans are well ahead for organizing a similar programme in Colombia with the possibility of a further one in Kenya. Members of the commission are committed to running a training workshop as a pre-congress activity prior to the 4th Asian Pacific Congress of Clinical Chemistry to be held in Hong Kong, August 1988. Plans are also being laid to organize a training programme in the Republic of China at the same time.

H. G. J. Worth

Conferences

Next IUPAC Congress in Stockholm

IUPAC SPONSORED

The 32nd International Congress of Pure and Applied Chemistry will be held from Wednesday 2 to Monday 7 August, 1989 at the Stockholm International Fairs, Sweden. The opening ceremony will take place on Wednesday morning. Evening and daytime social activities are being planned.

The scientific programme will be mainly devoted to seven areas of chemistry. Sessions on these areas will take place both concurrently and sequentially. Prominent chemists from all over the world will be invited to present plenary and keynote lectures.

Participants are encouraged to contribute lectures as well as posters. The subject matter of the posters is not necessarily limited to the areas mentioned below. Details regarding submission of papers will be given in the second circular, available in April, 1988.

Section I **Large-scale separation of biological macromolecules, cells and particles.**
- Recovery of bioproducts directly from crude homogenates.
- Chromatographic techniques, conventional and HPLC.
- Affinity purification techniques.
- Electrokinetic techniques.
- Automation and control of separation processes in biotechnology.

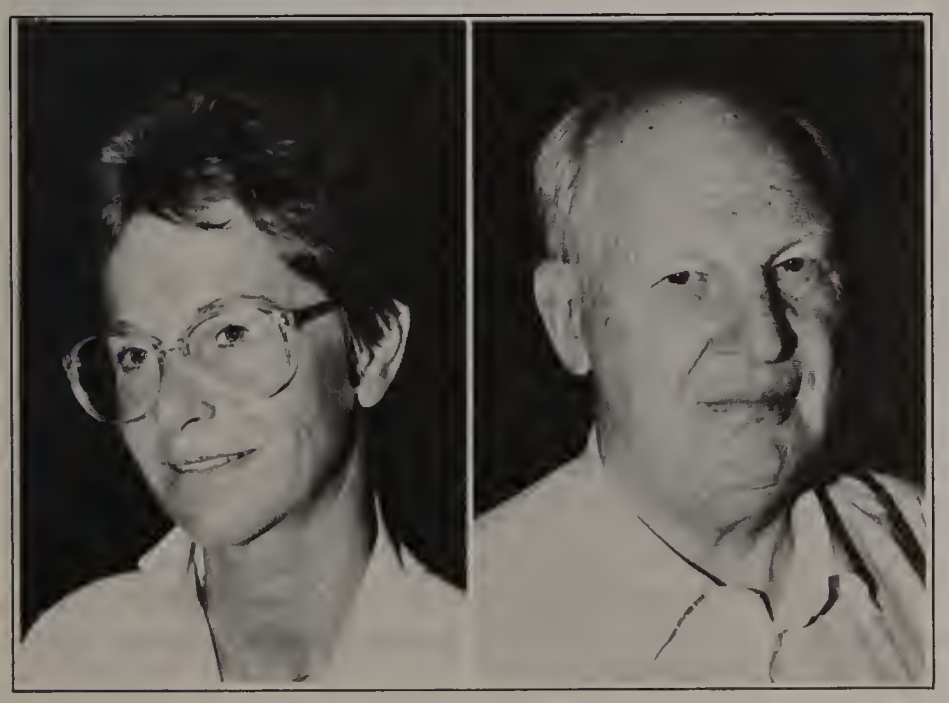
Section II **Atmospheric and marine chemistry.**
- Atmospheric chemistry.
- Air-sea interface chemistry.
- Marine chemistry.
- Marine biochemistry.
- Analytical air and sea chemistry.

Section III **Chemical communication and interaction between organisms.**
- The chemistry of exocrine chemical signals.
- Structure–activity relationships.
- Chemical application for pest control.

Section IV **Solid state chemistry-frontiers in the chemistry of inorganic materials.**
- New preparative routes to inorganic materials.
- Low-dimensional solids.
- Extended defects and grossly non-stoichiometric solids.
- The chemistry of new electronic, magnetic and super-conducting materials.
- The chemistry of high-performance ceramics and super-hard materials.

Section V **Structure and dynamics of macromolecules.**
- Dynamic aspects of protein structures.
- Computational chemistry.
- Protein engineering.
- Interaction between macromolecules.
- Folding.

Section VI **Electron transfer reactions.**
- Mechanisms of electron transfer reactions of organic molecules.



The Swedish National Committee for Chemistry is responsible for the detailed organization of the next Congress. Ingvar Lindqvist (right) is Chairman of the Programme Committee and Birgitta Eriksson (left) is one of the General Secretaries. Both are members of the Congress Coordination Committee and both attended the Congress in Sofia.

- Organic syntheses using electron transfer mediated steps.
- Photoelectrochemistry, photochemistry and chemiluminescence.
- Conducting and superconducting organic materials.
- Electron transfer and toxicity.

Section VII Chemistry and biochemistry of bile acids.

- Analytical chemistry of bile acids.
- Physical chemistry of bile acids.
- Biosynthesis and metabolism of bile acids.
- Inborn and acquired defects in bile acid biosynthesis.

The official language of the Congress will be English.

Further information concerning the Congress is available from: IUPAC, c/o Stockholm Convention Bureau, PO Box 6911, S-102 39 Stockholm, Sweden. Telephone +46 8 23 09 90. Telex +11556. Telefax +46 8 34 84 41.

Methodology in the teaching of chemistry

IUPAC SPONSORED

San Luis, Argentina, 22–25 June 1988

The 1st International-Argentinian Meeting on Methodology in the Teaching of Chemistry (PRAIMEQ-I) is being organized by the National University of San Luis. The motto of the meeting is:

> "Chemistry: a universal language for the unity of nations."

The conference aims to:

- promote new ideas efficiently to obtain a learning–teaching methodology at all levels according to a continuously changing reality,
- stress the methods employed in scientific research and its relevance for reaching significant goals,
- intensify the study of mechanisms leading to a wider vision of the different forms of learning in relation to currently applied methodologies,
- emphasize the search for mechanisms that enable experimental chemistry to be taught in relation to other sciences applied to developing countries,
- promote the production of ideas and projects showing the relationship between chemistry and society,
- elaborate programmes of learning methodologies in the chemical sciences that help students at all levels to develop their manual and intellectual skills,
- establish a system of permanent consultation facilitating the exchange of chemistry teaching experiences and methodologies,
- promote chemistry as an important educational experience of all students through the application of modern methods.

The organizers formulate plans for the chemistry teaching conference at the National University of San Luis: (from left) Prof. Roberto Olsina (Dean of Chemistry Faculty, National University of San Luis); Prof. José Miguel Abrahim (Chairman of PRAIMEQ-I); Prof. Lydia Cascarini de Torre (Member of the PRAIMEQ-I International Committee); and Prof. Alberto Puchmuller (Rector — National University of San Luis).

The scientific programme of the conference will consist of plenary lectures; special presentations; small group discussions and options; poster presentations; demonstrations of experiments, audio-visual and microcomputer programmes; displays of textbooks and equipment; and informal meetings.

The conference languages will be Spanish and English. Efforts will be made to provide participants with simultaneous translation.

The registration fees are USD 40.00 for participants with a 10% reduction for IUPAC Affiliates and USD 15.00 for students. Accommodation will be provided in local hotels and residences at rates ranging from USD 20.00 to USD 40.00.

San Luis city is in the centre of the Argentine Republic — about 800 km from Buenos Aires. It is surrounded by mountains.

It will be winter at the time of the meeting. The weather will be cold, with sunny days. It seldom snows and does not rain much. The average temperature in June is about 9°C.

Photochemistry

Bologna, Italy, 17–22 July 1988 IUPAC SPONSORED

The 12th International Symposium on Photochemistry will be held at the Palazzo dei Congressi of Bologna. The scientific programme includes the following plenary lectures:

- Electron transfer photochemistry of organic amides and imides (J. D. Coyle, UK).
- Photodissociation of molecules. The microscopic path of a molecular decay (J. R. Huber, Switzerland).

- Structure and function of the photosynthetic reaction centre from *Rhodopseudonomas Viridis* (H. Michel, FRG).
- Polysilane photochemistry (J. Michl, USA).
- Second-sphere donor–acceptor interactions in excited states of coordination compounds (F. Scandola, Italy).
- New photochemistry of 2,5/cyclohexadien-1-ones and related compounds (A. G. Schultz, USA).
- Novel insights into photoisomerization of olefins (K. Tokumaru, Japan).
- Photoprocesses in liquid crystals and related media (R. Weiss, USA).
- Light induced electron transfer processes at interfaces (M. S. Wrighton, USA).
- Photochemistry in the picosecond and femtosecond age (A. H. Zewail, USA).

Invited lectures will be given by A. Albini (Italy), J. Faure (France), M. A. Fox (USA), F. W. Grevels (FRG), J. Lugtenburg (Netherlands), H. D. Roth (USA), T. Shimidzu (Japan), H. J. Timpe (GDR) and K. Zamaraev (USSR).

Panel discussions will be held on the following topics:

1. Supramolecular photochemistry.
2. Up-date on the technology of preparative photochemistry.
3. Photochemistry and environment.
4. Interaction of theory and experiment in organic photochemistry.

The scientific programme will also include posters and a limited number of contributed papers.

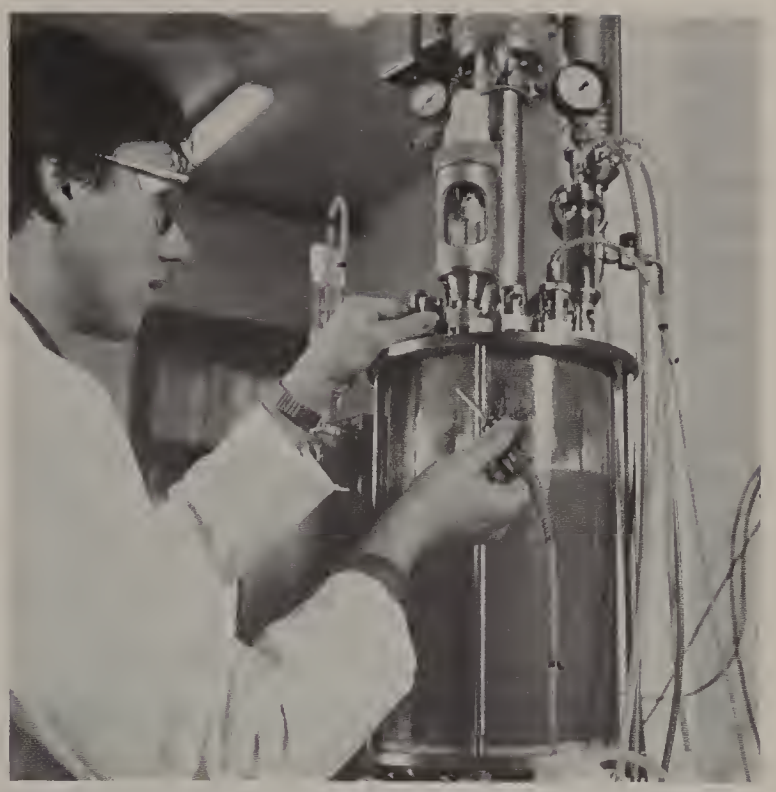
Registration fees are ITL 330 000 for active participants, ITL 150 000 for university students and ITL 100 000 for accompanying persons. The fee includes a welcome reception, hotel arrangement at discounted prices, public transportation tickets, coffee breaks, half-day tour to Ravenna, book of abstracts (for active participants and students) and a guided walking tour in the centre of Bologna (for accompanying persons). Several other conference tours for accompanying persons and post-conference tours will be available.

Biotechnology

Paris, France, 17–22 July, 1988 IUPAC SPONSORED

The 8th International Biotechnology Symposium will be held in the Palais de Congrés, Place de la Porte Maillot, Paris. The scientific programme will include invited lectures, round-tables and posters. There will be 21 sessions:

- Basic microbiology.
- Genetics of animal cells.
- Genetics of microorganisms.



The 8th International Biotechnology Symposium will include a session on bioreactor technology and control. (*Photo courtesy CIBA-GEIGY Ltd.*)

- Cell culture.
- Protein design.
- Enzymes and organelles.
- Mass transfer and bioprocess kinetics.
- Bioreactor technology and control.
- Downstream processing.
- Production of physiologically active molecules in heterologous systems.
- Vaccines.
- Biological reagents.
- Recent progress in food and feed biotechnology.
- Plant biotechnology and its impact on agriculture.
- New developments in the production of industrial chemicals.
- Biohydrometallurgy.
- Environment and waste treatment.
- Patents, economic problems.
- Safety.
- Education.
- Biotechnology in developing countries.

The opening lecture will be given by F. Gros (Institut Pasteur, Paris). Simultaneous translation from French to English will be provided at the opening session. Other sessions will be in English. The abstract book with summaries of invited lectures and accepted posters will be available free of charge to participants at the symposium desk. Proceedings comprising full texts of lectures will be published in the second half of 1988.

Accommodation will be available at hotels on the symposium site and in the vicinity of the Palais des Congrés. Visits to industrial and technical centres

and to scientific laboratories will be arranged during the symposium.

The registration fees are FRF 2500 (participants), FRF 1000 (students) and FRF 1000 (accompanying persons). The fee includes the abstract book, entry to all the symposium sessions, a commercial exhibition, a get-together cocktail and a concert. In addition to the social events there will also be an accompanying persons programme.

Macromolecules
Kyoto, Japan, 1–6 August 1988

IUPAC SPONSORED

The 32nd International Symposium on Macromolecules (MACRO 88) will be held at the Kyoto International Conference Hall.

The conference topics are grouped under six headings:

- Polymerization chemistry.
- Synthesis of new polymers and polymer reactions.
- Structure and properties of polymers.
- High performance polymers.
- Functional polymers.
- Bio-related polymers.

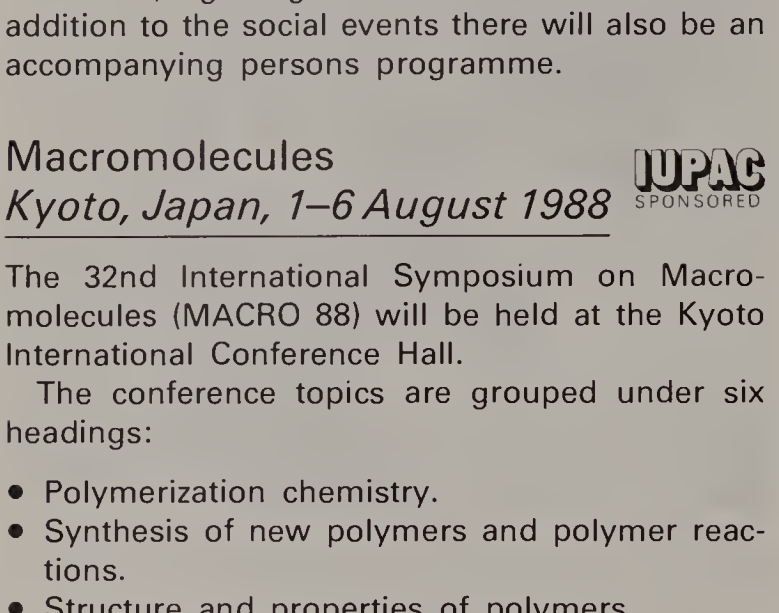
Plenary lectures will be presented by W. J. Bailey (University of Maryland, USA), E. W. Fischer (Max-Planck Institute, FRG); and Y. Ito (Toray Industries, Inc., Japan).

The language of the symposium will be English. No interpretation facilities will be available. The plenary, invited and session lectures will be published by Blackwell Scientific Publications.

Registration fees are JPY 40 000 for active participants; JPY 20 000 for students and JPY 15 000 for accompanying persons. A 10% reduction will be made for IUPAC affiliates. Accommodation is available in high-quality hotels at rates ranging from JPY 7000 to JPY 9000.

At the beginning of August it is warm in Kyoto. The daytime temperature may reach 33°C. However, the conference halls and hotels are air-conditioned.

Kyoto was the capital of Japan for more than one thousand years (794–1864). The city is the centre of Japanese culture with many temples, shrines, tranquil gardens and beautiful screen paintings.



Kyoto International Conference Hall. The MACRO 88 logo is the image generated by the two-dimensional Fourier transform of a spherulite of poly(vinylidene fluoride) obtained by using a polarizing microscope and a supercomputer.

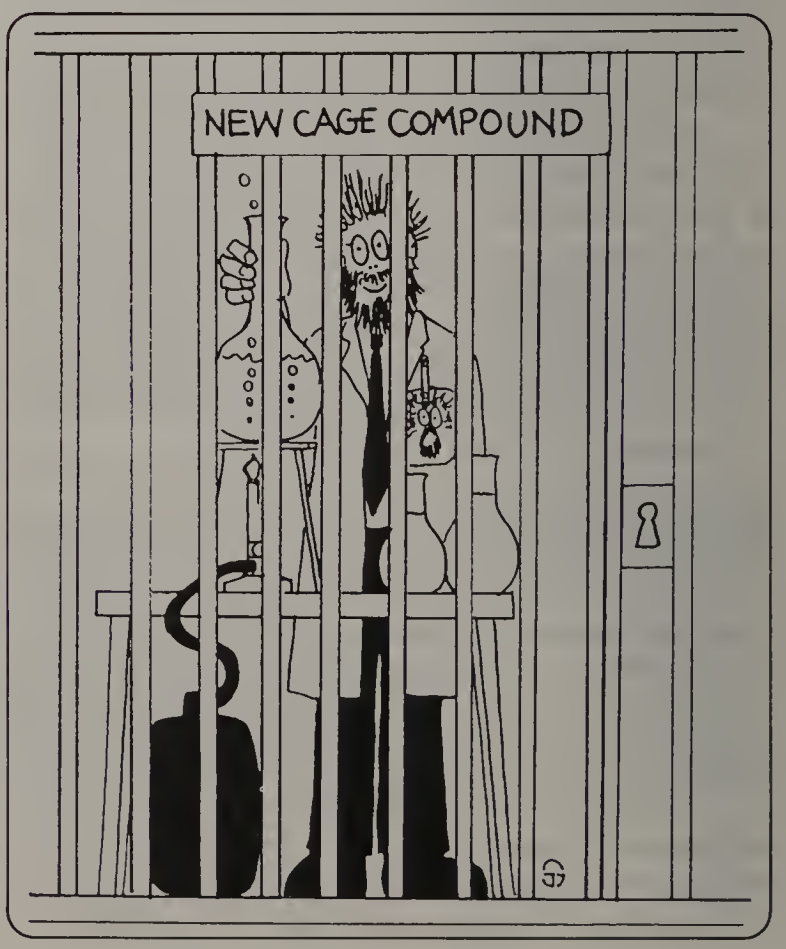
Inorganic ring systems
Massachusetts, USA, 8–12 August 1988

IUPAC SPONSORED

The 5th International Symposium on Inorganic Ring Systems (IRIS V) will be held at the University of Massachusetts, Amherst.

The topics covered at the symposium will centre on new ring systems, cages, and clusters of non-metal and organo-metallic elements with emphasis on the main group elements. Syntheses, mechanistic features, and structure and bonding will form the main theme. A session on biochemical aspects and a session dealing with applications will also be included in the programme. The proposed session titles are:

- Ring opening polymerization reactions.
- New structural classes.
- Mechanisms of ring reactions.
- Rings with unusual properties.
- Comparisons of ring systems of different elements.



- Inorganic polymers.
- Ceramic precursors.
- Cages and clusters.
- Bioinorganic chemistry.
- New synthetic routes.
- Nucleophilic substitution.

The conference fees are USD 225.00 for active participants and USD 115 for associate participants and students. The fee for active participants covers attendance at all technical sessions, symposium publications including abstracts, breakfasts and lunches, banquet, reception and conference tour.

The official language of the symposium is English.

Accommodation is availagle in dormitory housing at USD 17.00 per person per night or in the Campus Center Hotel at USD 50.00 per night single occupancy.

Amherst in early August should have mild summer weather. Rain showers do occur during this time of the year but are usually brief.

Carbohydrates
Stockholm, Sweden, 14–19 August 1988

IUPAC SPONSORED

The 14th International Carbohydrate Symposium will be held in the Congress Hall "Folkets Hus", Stockholm, located centrally in downtown Stockholm.

The symposium is concerned with all aspects of chemistry, biochemistry and technology, both academic and industrial. The scientific programme will include plenary lectures, each covering a broad summary of its assigned topics, and also an extensive poster session and workshops mainly based on the contents of the posters. Each workshop will be headed by a chairman who will select contributions from the various posters to be briefly presented orally and to be discussed in a round-table rather than in a lecture atmosphere. Main topics for plenary and poster/workshop presentations are:

- *Structure*: including primary structure, conformational analysis, spectrochemical methods and analysis, applied to low molecular weight compounds, polysaccharides and the use of carbohydrates as chiral synthons.
- *Synthesis*: including new methods, the synthesis of biomolecules such as low molecular weight carbohydrates, antibiotics, oligosaccharides, polysaccharides, glycoconjugates and the use of carbohydrates as chiral synthons.
- *Biological aspects*: including interactions of carbohydrates and glycoconjugates with proteins and biosynthesis.
- *Industrial aspects*: selected topics of various uses of carbohydrates in industry.

The preliminary plenary lecturers are H. Baer (Canada); D. Bundle (Canada); S. J. Banishefsky (USA); I. C. M. Dea (UK); B. Fraser-Reid (USA); L. Kenne (Sweden); J. Lönngren (Sweden); H. Mayer (FRG); K. Nakanishi (USA); T. Osawa (Japan); F. A. Quiocho (USA); R. R. Schmidt (FRG); G. Spik (France) and I. Tvarosk (Czechoslovakia).

The official language of the symposium will be English. Abstracts of all contributions will be published in an abstract book which will be distributed to all registrants on site. The plenary lectures will be published shortly after the symposium.

The social programme will include a mixer, a reception and a banquet. Various optional tours and excursions will be available. Accommodation will be arranged in a relatively small number of centrally located hotels of varying price range and standard.

Stockholm presents a rich cultural and historical scenario. It is unique in its location on the waters reaching from the Baltic Sea into Lake Mälaren. The temperature in August is about 20°C.

Solution chemistry
Lund, Sweden, 15–18 August 1988

IUPAC SPONSORED

The 19th International Conference on Solution Chemistry will be held at the Sparta Conference Center and the Chemical Center, Lund.

The scientific programme will consist of invited lectures, contributed papers and posters. The following invited lectures will be given:

- Complexation of noble transition metals in liquid ammonia (J. B. Gill, Leeds, UK).
- Recent aspects of single ion transfer properties (G. Gritzner, Linz, Austria).
- Structural, bonding and dynamic exchange information on transition metal carbonyl clusters in solution from multi-nuclear magnetic resonance studies (B. Heaton, Liverpool, UK).
- Room temperature haloaluminate ionic liquids, novel solvents for transition metal solution chemistry (C. L. Hussey, Mississippi, USA).
- To what extent can structures of complexes in solution be determined from XZ-ray diffraction data? (G. Johansson, Stockholm, Sweden).
- Some recent developments in solvation and dynamics of lanthanide (III) ions (A. Merbach, Lausanne, Switzerland).
- Diffractions studies of aqueous electrolyte solutions (G. W. Neilson, Bristol, UK).
- Sequestering agents specific for high oxidation state cations (K. N. Raymond, Berkeley, USA).

The main topics for the contributed papers and posters will be:

1. Structural and thermodynamic aspects of solvation and complex formation in solution.

2. Kinetics and mechanisms of reactions in solution.
3. Spectroscopy in solution chemistry.

The official language of the conference is English. The registration fees are SEK 1000 for ordinary participants, SEK 600 for students and SEK 400 for accompanying persons. The fee for IUPAC affiliates will be reduced by 10%. The fee includes a conference tour, get-together party, University reception and, for active participants, the conference proceedings. Accommodation will be available in hotels at rates ranging from SEK 300 to SEK 700 (single).

Mycotoxins and phycotoxins

IUPAC SPONSORED

Tokyo, Japan, 16–19 August 1988

The 7th International Symposium on Mycotoxins and Phycotoxins will take place at Shigaku-kaikan, Tokyo. The official language of the symposium is English.

The scientific programme will include 10 symposia and poster sessions and the following plenary lectures:

- Molecular and cellular events associated with aflatoxin-induced hepatocarcinogenesis (G. N. Wogan, USA).
- Recent studies on paralytic shellfish poisons in Japan (K. Hashimoto, Japan).

The 10 symposia are on the following topics:

1. Ecology of toxin-producing fungi.
2. Analytical methods of phycotoxins.
3. Natural occurrence, epidemiology and toxicology of mycotoxins (1).
4. Natural occurrence, epidemiology and toxicology of mycotoxins (2).
5. Intoxication with phycotoxins.
6. Chemistry of phycotoxins.
7. Mycotoxins control in foods and feeds.
8. Toxicology and pharmacology and phycotoxins.
9. Chemistry of mycotoxins.
10. Regulation of toxins.

The registration fees are JPY 40 000 for participants and JPY 20 000 for students. The fees cover the programme and abstracts, a mixer and coffee services. The rates for hotel acommodation range from JPY 6420 to JPY 13 550 for a single room.

In mid-August the weather in Tokyo will be hot and humid. The average temperature is about 31°C and the relative humidity about 73%.

Analysis of Oils and Fats

A Short Workshop to be held at St Andrews, Scotland

22 - 24 August 1988

Organised by the IUPAC Commission on Oils, Fats and Derivatives in association with the Chemistry Department of the University of St Andrews and the Laboratory of the Government Chemist (UK).

The workshop will be of special interest to both senior and junior analysts in official and industrial laboratories involved in the analysis of oils and fats and will provide a comprehensive approach to the analysis of oils and fats using the most up-to-date equipment and analytical techniques with particular emphasis on practical work. Oral presentation of the methods will be followed by demonstrations and participants will have the opportunity to gain practical experience of the methods to be demonstrated.

The cost of the course, including all meals, refreshments and accommodation for two nights in the St Andrews University Halls of Residence is £260 + £39 VAT (£299).
For IUPAC members the cost is £200 + £30 VAT (£230).

For further details and registration form, please apply immediately to:
Mr W D Pocklington, IUPAC Commission VI.3 Secretary, Laboratory of the Government Chemist, Cornwall House, Waterloo Road, London SE1 8XY, England.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1988

Biological Reference Materials

4–7 May. Third International Symposium on Biological Reference Materials. Bayreuth, Federal Republic of Germany.
(Dr Marcus Stoeppler, Institut für Angewandte Physikalische Chemie — ICH-4, Kernforschungsanlage Jülich GmbH, Postfach 1913, D-5170 Jülich 1, Federal Republic of Germany.)

Drugs in Competitive Athletics

29 May–3 June. First International Symposium on Drugs in Competitive Athletics. Islands Brioni, Yugloslavia.
(GENERAL TURIST, Congress Department, Praska 5, 41000 Zagreb, Yugoslavia.)

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1–5, Kanda Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Surface and Colloid Science

5–10 June. 6th International Conference on Surface and Colloid Science. Hakone, Japan.
(Prof. K. Meguro, General Secretary of 6-ICSCS, c/o Division of Colloid and Surface Chemistry, The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Chemistry Teaching Methodology

22–25 June. First International-Argentinian Meeting on Methodology in the Teaching of Chemistry (PRAIMEQ-1). San Luis, Argentina.
(Prof. J. M. Abraham, Facultad de Química, Bioquímica y Farmacia, Universidad Nacional de San Luis Chacabuco y Pedernera, 5700 San Luis, Argentina.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubere, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-lès-Nancy Cédex, France.)

Modified Polymers

5–8 July. 7th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia.
(Dr A. Romanov, Polymer Institute, Centre for Chemical Research, Slovak Academy of Sciences, 842 36 Bratislava, Czechoslovakia.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia.
(P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia.)

Biotechnology

17–22 July. 8th International Biotechnology Symposium. Paris, France.
(8th International

Dr Andrej Romanov, Chairman of the Organizing Committee of the 7th Bratislava International Conference on Modified Polymers. Dr Romanov is Director of the Polymer Institute CCR of the Slovak Academy of Sciences.

Biotechnology Symposium, c/o S.O.C.F.I., 14 rue Mandar, 7502 Paris, France.)

Photochemistry

17–22 July. 12th International Symposium on Photochemistry. Bologna, Italy.
(XII IUPAC Symposium on Photochemistry, c/o Prof. F. Bolletta, Departimento di Chimica "G Ciamician", Università di Bologna, Gia Selmi 2, 1-40126 Bologna, Italy.)

Poly(Vinyl Chloride)

18–21 July. 31st Microsymposium on Macromolecules: Poly(Vinyl Chloride). Prague, Czechoslovakia.
(P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(MACRO 88 Secretariat, The Society of Polymer Science Japan, Honshu Building, 5-12-8 Ginza, Chuo-ku, Tokyo 104, Japan.)

Inorganic Ring Systems

8–12 August. 5th International Symposium on Inorganic Ring Systems. Amherst, Mass., USA.
(Prof. R. R. Holmes, Department of Chemistry, University of Massachusetts, Amherst, MA 01003, USA.)

Carbohydrates

14–19 August. 14th International Carbohydrate Symposium. Stockholm, Sweden.
(XIVth ICS 1988, c/o Stockholm Convention Bureau, Box 6911, S-10239 Stockholm, Sweden.)

Solution Chemistry

15–18 August. 19th International Conference on Solution Chemistry. Lund, Sweden.
(XIX ICSC, c/o Dr Ingmar Persson, Inorganic Chemistry 1, Chemical Center, PO Box 124, S-22100 Lund, Sweden.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Y. Ueno, c/o Inter Group Corp., Akasaka Yamakatsu Building, 8-5-32, Akasaka, Minato-ku, Tokyo 107, Japan.)

Thermal Analysis

21–25 August. 9th International Congress on Thermal Analysis. Jerusalem, Israel.
(The Secretariat — ICTA 9, PO Box 394, 61003 Tel Aviv, Israel.)

Physical Organic Chemistry

21–27 August. 9th International Conference on Physical Organic Chemistry. Regensburg, Federal Republic of Germany.
(Gesellschaft, Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Solubility Phenomena

23–26 August. 3rd International Symposium on Solubility Phenomena, Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Co-Chairman, Third International Symposium on Solubility Phenomena, Chemisty Department, University of Surrey, Guildford, Surrey GU2 5XH, UK.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(IUPAC Conference, PO Box 119, CS-160 Praha 6, Czechoslovakia.)

Coordination Chemistry

29 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. M. A. V. Ribeiro da Silva, XXV1 ICCC, Department of Chemistry, Faculdade de Ciências, 4000 Porto, Portugal.)

Molecules and Molecular Crystals

29 August–3 September. International Symposium on the Electronic Structure and Properties of Molecules and Molecular Crystals. Cavtat-Dubrovnik, Yugoslavia.
(Prof. Z. B. Maksic, Chairman of the Organizing Committee, Ruder Bošković Institute, PO Box 1016, YU-41001 Zagreb, Yugoslavia.)

Macrocyclic Chemistry

4–8 September. 13th International Symposium on Macrocyclic Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft, Deutscher Chemiker, Abt. Tagungen, Varrentrappstr. 40-42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Organometallic Chemistry

4–9 September. 13th International Conference on Organometallic Chemistry. Turin, Italy.
(Prof. Luciano Milone, Istituto di Chimica Generale ed Inorganica, Facoltà di Farmacia, Università di Torino, Via P. Giuria 9, I-10125 Turin, Italy.)

Raman Spectroscopy

5–9 September. XIth

International Conference on Raman Spectroscopy. London, UK.
(Dr John F. Gibson, Secretary (Scientific) Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.)

1989

Fats

6–9 June. International Congress Chevreul or Study of Fats. Angers, France.
(Dr A. Karleskind, Centre de Congres, 33 boulevard Carnot — 49100 Angers, France.)

Molecular Design of Functional Polymers

26–28 June. International Symposium on Molecular Design of Functional Polymers. Seoul, Korea.
(Prof. Tae Oan Ahn, Vice President — Polymer Society of Korea, Rm. 601, Kyecheon Building, 831, Yeoksam-dong, Kangnam-ku, Seoul 135, Korea.)

Coordination Chemistry

2–7 July. 27th International Conference on Coordination Chemistry. Queensland, Australia.
(XXVII ICCC Conference Secretariat, UniQuest Limited, University of Queensland, St. Lucia, Qld. 4067, Australia.)

Analytical Chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

IUPAC Congress

2–7 August. 32nd IUPAC Congress. Stockholm, Sweden.
(IUPAC, c/o Stockholm Convention Bureau, PO Box 6911, S-102 39 Stockholm, Sweden.)

IUPAC General Assembly

9–17 August. 35th IUPAC General Assembly, Lund, Sweden.
(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Ichiro Murata, Dept of Chemistry, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan.)

Calorimetry and Chemical Thermodynamics

25–28 August. International Conference on Calorimetry and Chemical Thermodynamics. Beijing, China.
(Prof. Hu Ri-heng, Institute of Chemistry, Academia Sinica, Beijing, China.)

1990

Natural Products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Prof. Sukh Dev, Malti-Chem Research Centre, Nandesari, Baroda-39340, India.)

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft, Deutscher Chemiker, Abt. Tagungen, PO Box 900440, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical Organic Chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
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Editors:
STANLEY S. BROWN, Director of Regional Laboratory for Toxicology, Birmingham, and **YASUSHI KODAMA**, Professor of Occupational and Environmental Health, Kitakyushu, Japan

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Contents: PART 1 — TRACE METALS IN HEALTH AND DISEASE: SOME GENERAL PRINCIPLES; PART 2 — CLINICAL AND EXPERIMENTAL STUDIES OF SPECIFIC METALS

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- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
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Front cover: Participants at the International Conference on the Applications of the Mössbauer Effect, Melbourne, Australia, August 1987.

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Introducing genetically modified organisms into the environment

In September 1987, a group of 20 molecular biologists, virologists, evolutionary biologists, geneticists and ecologists met in Bellagio, Italy, in a four-day effort to come to terms with issues involved in introducing new or altered organisms into the environment.

The workshop was organized by SCOPE (Scientific Committee on Problems of the Environment) and COGENE (Committee on Genetic Experimentation). This was the first time that two groups of the International Council of Scientific Unions (ICSU) had joined forces.

At its October meeting in Rome, the ICSU Executive Board, upon the recommendation of its Biological Unions, agreed to endorse a consensus statement drafted at the workshop. The following are excerpts from the statement.

"The spectrum of available tools for modifying organisms represents an evolving and expanding continuum which includes conventional methods, rDNA techniques, and others." (*Photo courtesy of Ciba-Geigy*.)

Introduction

Genetic change is a fundamental biological phenomenon and is the basic process of evolution. It has been exploited by humans for their own purposes throughout history. Recent methodological developments, such as advances in the applications of DNA (rDNA) techniques have expanded these capabilities and provide the opportunity for addressing a wide variety of pressing human needs including solutions to environmental problems.

Any human intervention into the environment carries an element of risk . . . but one must weigh any risks that might attend the implementation of the methodology against the benefits, and against any risks that might be associated with delaying implementation.

The environmental introduction of any organisms, modified or unmodified, should be undertaken within a framework that maintains appropriate safeguards for the protection of the environment and human health while not discouraging innovation. This implies that an ecological perspective is essential to the assessment of risks associated with any introduction.

There is considerable experience in the introduction of organisms into the environment. Familiar examples include vaccines, agricultural varieties, and biological control. The positive and negative lessons learned from these experiences provide a basis for the rational development of safeguards. Nevertheless, there is much that still needs to be known about such topics as systematics; community structure; the factors governing the survival, growth and spread of populations of introduced organisms; and techniques for monitoring.

Risks

The spectrum of available tools (for modifying organisms) represents an evolving and expanding continuum, which includes conventional methods, rDNA techniques, and others. While much attention has been focused on the methods used to modify organisms, it is the products of these technologies and the uses to which they will be put that should be the objects of attention, rather than the particular techniques employed to achieve those ends.

Each introduction of an organism, whether modified or not, must be judged on its own merits, within the context of the scale of the application and the possible environmental costs and benefits.

Size, geographical scale, and frequency of introduction are among the factors that are important

in determining whether a particular introduction will become established or spread. Therefore, small-scale field testing involves different consideration than does large-scale (e.g. commercial) application. This is not to suggest that small-scale testing should be exempt from examination or regulation, but simply that any risks are likely to be much smaller and more easily managed than are those for large-scale applications. Nor does this suggest that all large-scale applications will be problematical, since we have many examples to the contrary, including vaccines, biological control methods; and the use of rhizobia in agriculture.

One must bear in mind that the greatest impact on the biosphere is through human activity. For example, deforestation; the widespread use of antibiotics; vaccines, herbicides, and pesticides; or the widespread introduction of a single type of organism in agriculture, have led to a loss of genetic diversity. Such loss has had dramatic and unfortunate consequences for human survival because it has led to environmental degradation, loss of stability, and a depletion of biological resources.

Risk assessment

The properties of the introduced organism and its target environment are the key features in the assessment of risk.

It is important to note that generalizations developed for particular groups of organisms (e.g. micro-organisms) cannot be extended automatically to other groups (e.g. plants), which may have very different genetic and demographic characteristics, dispersal and reproductive mechanisms, and trophic positions.

In the development of assessment procedures, the potential for containment, monitoring, and mitigation must receive consideration. In this regard, it should generally be assumed that the likelihood of being able to recall introduced organisms that have escaped containment is very small.

Coda

The new genetic methodologies add additional tools to the spectrum of techniques available to improve the human condition. These will lead to rapid improvements in the development of ecologically sound approaches to agriculture and to environmental management, and in the acquisition of a better understanding of biological systems. These benefits in their various forms should be available to everyone, and know no national boundaries. It is therefore essential that the broadest possible international cooperation and data-sharing be supported by all countries. Each improvement in our capacity to modify the environment carries with it responsibilities to use that capability wisely; with special attention to the importance of maintaining biological diversity.

The above item is based on reports published in SCOPE Newsletter *No. 29, December 1987 and* Science International, *No. 31, December 1987.*

News & Views

Regional seminar in Buenos Aires

The Asociación Química Argentina is organizing a "Regional Seminar on Centers of Information on Technological Chemistry in Latin America" to be held 7–9 November 1988 in Buenos Aires. The seminar is cosponsored by the American Chemical Society, the Federación Latinoamericana de Asociaciones Químicas (FLAQ) and IUPAC.

The seminar aims to bring together chemists and experts from chemical information centres from different Latin American countries. Its main purpose is to review and appraise existing regional programmes and to define strategies and future actions for improved access to world sources of chemical information.

Further information from Asociación Química Argentina, Sanchez de Bustamente 1749, 1435 Buenos Aires, Argentina.

Chemistry International deadlines for authors

The following are deadlines for receipt at the IUPAC Secretariat of items for publication in forthcoming issues of *Chemistry International*. Note that the *minimum* delay between acceptance of an item and publication is three months.

CI *issue*			*Deadline*
September	1988	(Vol 10, No 5)	88.06.03
November	1988	(Vol 10, No 6)	88.08.05
January	1989	(Vol 11, No 1)	88.09.30
March	1989	(Vol 11, No 2)	88.11.25
May	1989	(Vol 11, No 3)	89.01.27
July	1989	(Vol 11, No 4)	89.03.31
September	1989	(Vol 11, No 5)	89.06.02
November	1989	(Vol 11, No 6)	89.08.04

Mössbauer mirth

Mössbauer seemed to have a magical effect on participants at the International Conference on the Applications of the Mössbauer Effect held at the University of Monash in Melbourne, Australia in August 1987. In the photograph on the right, conference organizers enjoy a Mössbauer joke during one of their meetings (from left: Stewart Campbell, Paul Clark, Fred Smith and John Cashion).

In the photograph on the left, Steen Morup amuses three participants with his poster "On the composition of welding fumes". A total of 165 participants from 29 countries attended the conference.

Address changes

Dr S. S. Brown (President, Clinical Chemistry Division). Fax: +44 (21) 551 5562.

Dr Joyce L. Beare-Rogers (Chairman, Commission on Oils, Fats and Derivatives). Telex: 053–3679 HWC HPB OTT CA.

Dr P. C. Kearney (President, Applied Chemistry Division). Natural Resources Institute, Room 233, Building 001, BARC-West, Beltsville, Maryland 20705, USA. Tel: +1 (301) 344 3030. Fax: +1 (301) 344 4335, Attn P. C. Kearney (344 3030).

Prof. G. J. Leigh (Secretary, Inorganic Chemistry Division). Fax: +44 (273) 678133.

Prof. G. H. Nancollas (President, Analytical Chemistry Division). Department of Chemistry, Acheson Hall, State University of New York at Buffalo, Main Street Campus, Buffalo, New York 14214, USA. Fax: +1 (716) 8312960.

Dr D. L. Park (Chairman, Commission on Food Chemistry). Telex: 187167 AZUTUC UT.

Prof. K. S. W. Sing (Chairman, Commission on Colloid and Surface Chemistry including Catalysis). Fax: +44 (895) 32806.

Mr J. A. Tetlow (Secretary, Commission on Water Chemistry). Fax: +44 (480) 59784.

Dr D Wyrsch (Chairman, Committee on Chemistry and Industry). Dyestuffs and Chemicals Division, CIBA-GEIGY AG, K-424.3.18, CH-4002 Basel, Switzerland.

IUPAC Handbook 1987–89

The handbook is produced bi-annually and provides detailed information on IUPAC, its personnel and IUPAC bodies. Its contents include full details of IUPAC officers and secretariat, membership of all IUPAC commissions and committees with a full alphabetical index of names and addresses, listings of all official current programmes of the various commissions and information on the IUPAC affiliate membership scheme.

IUPAC Handbook 1987–89 *is to be published Summer 1988. A limited number of copies are available to IUPAC affiliates at a discount. The handbook will be available from Blackwell Scientific Publications Ltd, Osney Mead, Oxford OX2 0EL, UK. Price to be announced later.*

On being a scientist

Prof. John Polanyi presented a lecture "On being a scientist" to high school science students and science teachers at the Ontario Science Centre, Toronto, Canada on 5 March this year. The lecture was the first of an annual lecture series sponsored by the Canadian National Committee for IUPAC in honour of John and Michael Polanyi. The lecture series is a project of the Canadian IUPAC Company Associates.

Polanyi of the University of Toronto won the 1986 Nobel Prize in Chemistry. Last year he lectured on reaction dynamics at the Boston General Assembly (see p. 000 of the March 1988 issue). In his Toronto lecture to high school students he talked about his schooling, how he chose a career in science, the work that won him the Nobel Prize and about his future research.

John Polanyi demonstrates the dexterity of a Nobel Prize winning scientist as he dissects a lobster at the Boston General Assembly clambake.

We regret to record the death of:

Dr F. L. Rose, UK (2 March 1988) – Section on Medicinal Chemistry (1969–1973).

Mr R. Schoenfeld, Australia (24 November 1987) – Commission on Nomenclature of Organic Chemistry (1979–87).

New IUPAC telephone number

The IUPAC Secretariat now has a new telephone number: +44 (865) 747744

Spanish translations

"Recommendation (1986) on abbreviations for biological systems and quantities relevant to clinical chemistry" has been translated into Spanish by the Confederación Latinoamericana de Bioquímica Clínica (COLABIOCLI). The translation was published in the official journal of COLABIOCLI: *Acta bioquímica clínica latinoamericana*, Vol. XXI, No. 4, pp. 537–541, 1987.

A Spanish edition of *Nomenclature of Organic Chemistry*: Sections A, B, C, D, E, F and H, 1979 edition (the Blue Book) was published in 1987 as a co-edition of the Real Sociedad Española de Química and the Consejo Superior de Investigaciones Científicas: *Nomenclatura de la química-orgánica*: ISBN 84 00 06638 3.

Catalan Orange Book

A Catalan version of the 1978 edition of the *Compendium of Analytical Nomenclature* (the Orange Book) was published by the Institut D'Estudis Catalans, Barcelona in 1987. The title is *Compendi de Nomenclatura de Química Analítica*: ISBN 84 7283 121 3. Catalan versions of the Blue Book (Organic nomenclature) and the Red Book (Inorganic nomenclature) are progressing.

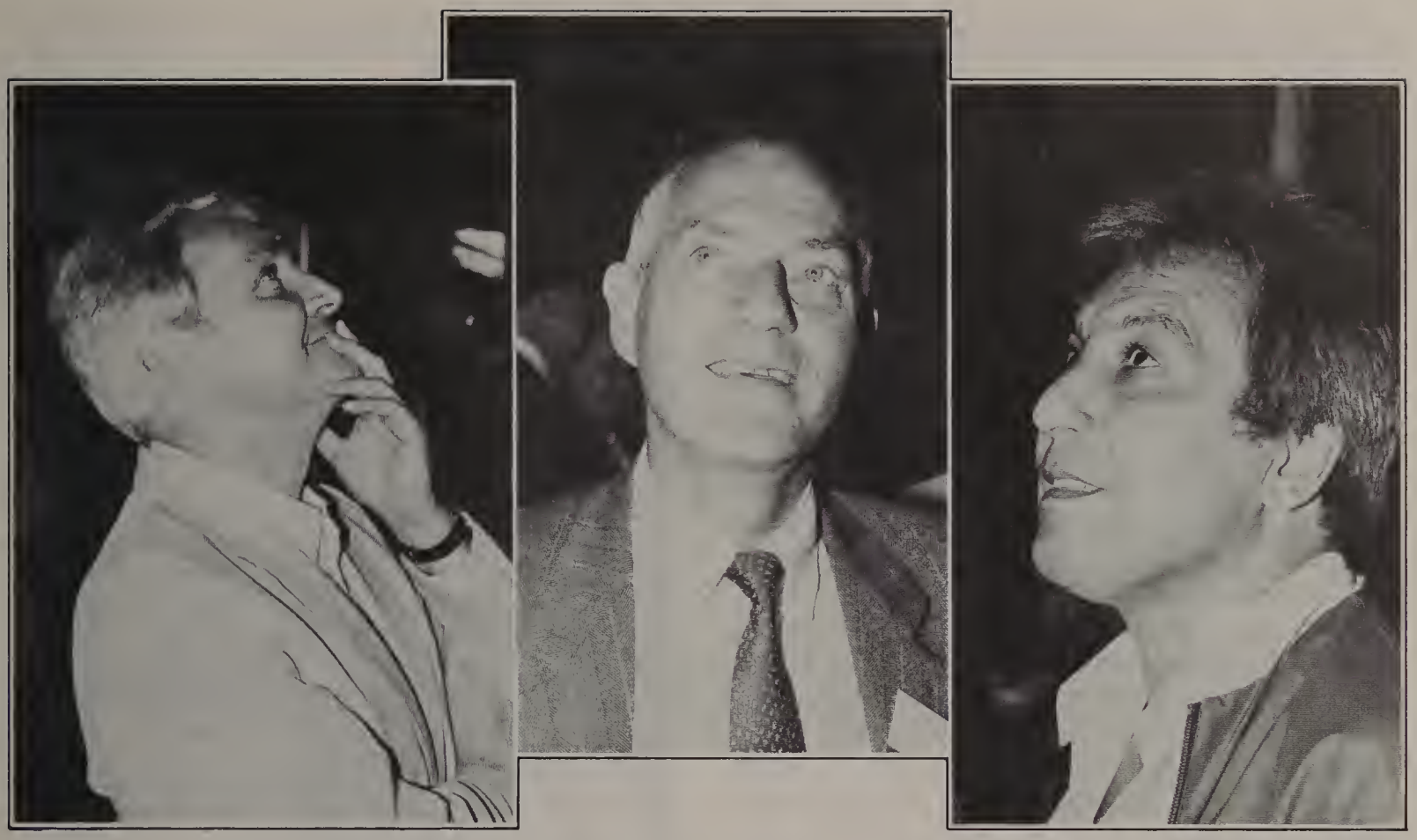
Clinical chemistry recommendation

The following three parts of the International Federation of Clinical Chemistry (IFCC) approved recommendation (1987) on the theory of reference values were published in *J. Clin. Chem. Clin. Biochem.*, Vol. 25, No. 9, 1987:

- IFCC 1987/8. Part 2. Selection of individuals for the production of reference values (pp. 639–644).
- IFCC 1987/9. Part 5. Statistical treatment of collected reference values. Determination of reference limits (pp. 645–656).
- IFCC 1987/10. Part 6. Presentation of observed values related to reference values (pp. 657–662).

Conference postponed

The IUPAC sponsored International Conference on Aquatic Toxicity Reduction and Control which was to have been held in Nashville, USA, 1–3 November 1988 has now been postponed. A new date for the conference has not yet been fixed.



What *are* they looking at?

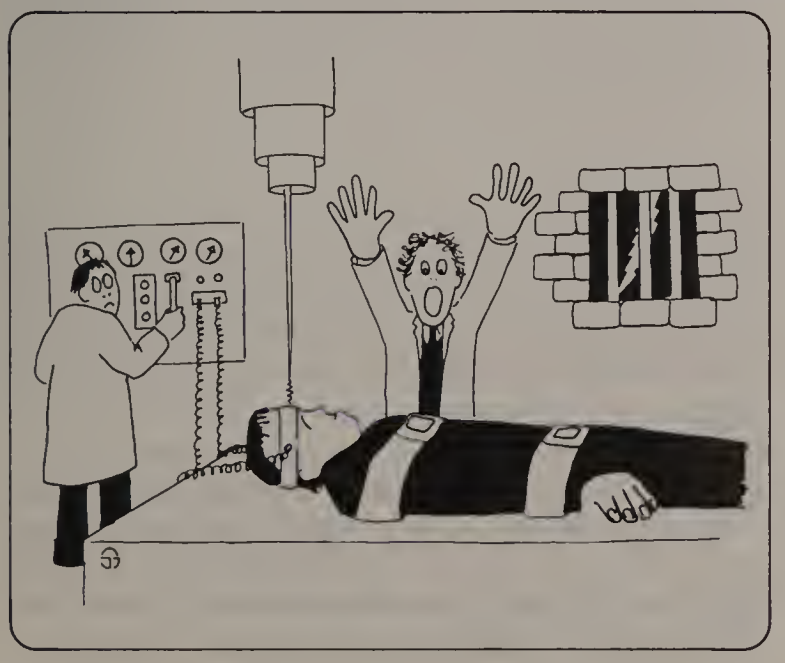
What object of fascination has attracted the gaze of Professors Ekkehard Fluck (President of Division II, left); Yves Jeannin (IUPAC Vice-President, centre) and Ognyan Peshev (Bulgarian National Affiliate Membership Secretary, right)? The answer can be seen on page 138.

Letter to the Editor

Frankenstein chemistry revamped

Sir,

In the January issue of *Chemistry International* you reviewed the work of Prof. H. Allen O. Hill on bioelectrochemistry (see Vol. 10, No 1, pp. 33–34, 1988). Readers might be interested to learn that this field is probably an off-shoot of one reported some 55 or more years ago.



In the motion picture 'Frankenstein', released by Paramount Pictures, Hollywood, 1931, the audience was informed that Dr Frankenstein (played by Colin Clive) was an expert in the field of **chemical galvanism and electrobiology**. Although Dr Frankenstein demonstrated the practical aspects of this field, further practical applications seem to have vanished from the literature. Are we now ready to resume this pursuit?

Mark Salomon
Chairman, Subcommittee on
Solid Solubilities

A typical day in the life of Brehane Mewa

Brehane Mewa is President of the Chemical Society of Ethiopia. Last year he attended the Boston General Assembly and later visited the IUPAC Secretariat in Oxford. *Chemistry International* asked him to describe his work in Ethiopia, the activities of CSE and to comment on the famine in the country.

Ethiopia is an IUPAC Observer Country. It is represented by the Chemical Society of Ethiopia. Last year, CSE president, Brehane Mewa attended the IUPAC General Assembly in Boston and sat as an observer at the Council meeting. He then attended the 11th International Meeting of Chemical Society Presidents in New Orleans (see p. 46 of the March issue of *CI*).

Mewa was born in October 1950. From 1967 to 1971, he studied at the Polytechnic Institute, Baher Dar, where he obtained a Diploma in Industrial Chemistry. Following this he was employed as a chemist in a rubber processing plant in Addis Ababa. In 1974 he was promoted to technical manager at the plant.

After three years at the plant Mewa decided to leave and go to university. At the same time he started his own business manufacturing wax products, soaps and cosmetics and then later, rubber products. He obtained a degree in chemistry in 1981 from Addis Ababa University. He is now General Manager of PPIC (Processing of Poly Industrial Chemicals).

Brehane Mewa at the Boston General Assembly Council meeting.

Science and technology in Ethiopia

In August 1986 Mewa became CSE president for a period of two years. CSE was established in 1983 with 40 founding members (see p. 9, *CI*, August 1986). One of the major aims of the society is to promote and popularize chemistry in Ethiopia.

Until 1987, CSE published a *Chemistry Newsletter*. The seventh and last issue (Vol. 4, No. 1, February 1987) included a feature article on sulphuric acid plants for Ethiopia. CSE then decided to upgrade the newsletter to a bulletin published twice yearly. The editor is CSE past-president Berhanu Abegaz.

Volume 1, Number 1 of the CSE *Bulletin* was published in June 1987. The issue included a feature article by Gunnar Samuelson (Uppsala, Sweden) on plants used in traditional medicine as sources of drugs, as well as papers by researchers at universities in Ethiopia, GDR, FRG, Nigeria, Poland and USA.

The first CSE congress was held in 1983. Mewa was heavily involved in its organization. He also presented papers on rubber technology and environmental problems related to chemicals.

According to Mewa, science and technology is becoming well established in Ethiopia. The country has three universities – at Addis Ababa, Asmera and Alemmaya. Chemistry graduates go into industry or teaching.

When he visited the IUPAC Secretariat in September 1987, Mewa said that the famine situation has probably improved over the past two years. However, he expected further problems over the next 12 months due to shortage of grain in the winter. He believed that the only solution to the famine is self-sufficiency in food production. This would become possible as a result of government central planning. Involvement of professional people in science and technology is a key factor in this respect.

A typical day

Mewa wakes up about 7.00 a.m., breakfasts on tea and ferfer – traditional food made from teff seed, bread, margarine, jam. He is in his office by 8.00. He is General Manager of a plant which he owns. There are 13 employees with whom he has meetings at least once a week. The working week is from Monday to Saturday – Saturday being a half day.

The plant makes various rubber articles including industrial spare parts, automobile parts (but not tyres) and building materials. Mewa is especially interested in products which bond rubbers to

various surfaces and the production of rubber seals to stop leaks. Initially he made his own machines and equipment – for example mixing mills and vulcanizing presses. These were made from scrap metals collected from garbage heaps.

". . . machines and equipment made from scrap metals collected from garbage heaps . . . "

Mewa speaks English and Amharic which is the official language of Ethiopia. He likes to read applied science books and for relaxation goes swimming and camping and plays chess. He is married and has one daughter (aged 9) and three sons (aged 5, 8 and 10). They now live in a house which he finished building this year. The house – which is about 10 km from his plant – has one living room, three bedrooms and a garden. Mewa owns two cars.

Although he travels three or four times inside Ethiopia each year, this was his first trip to Europe and North America. He was impressed with IUPAC – particularly its efficiency and the way it encourages international cooperation between scientists. He is a keen supporter of the affiliate membership scheme in Ethiopia (28 young chemists were nominated by CSE for affiliate membership in 1988).

The International Organization of Legal Metrology

John D. Cox

The International Organization of Legal Metrology (OIML) was founded in 1955 to promote international harmony in the development of measurement systems required by national governments. Initial emphasis was on measurements linked to commerce, but the scope has now been widened to include measurements linked to health, safety and environmental protection. OIML's work programme contains several chemical items: increased dialogue between IUPAC and OIML on these items would be mutually beneficial.

The purpose of this article is to make the International Organization of Legal Metrology more widely known amongst chemists: its acronym OIML is derived from the French version of its title, Organisation Internationale de Métrologie Légale, since French is the official language of the organization. The headquarters of OIML is in Paris, but, as is the case with IUPAC, much of the technical work is devolved to pilot secretariats (roughly equivalent to IUPAC's commissions), which may be centred in any of the member states.

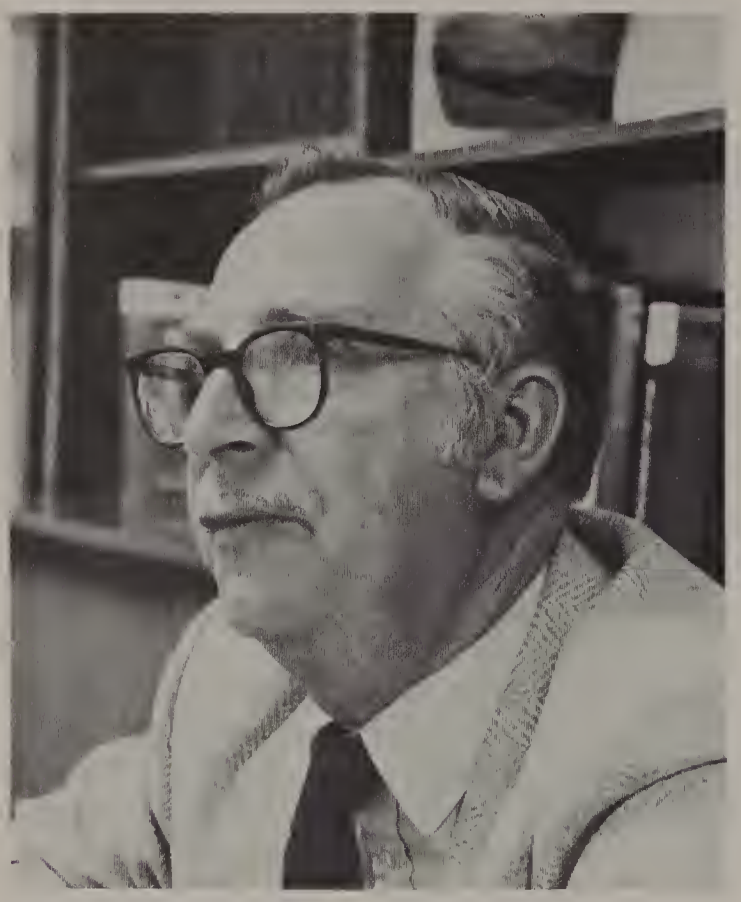
The core discipline of OIML's activities, legal metrology, is concerned with technical measurements required by statute and (usually) subject to control by governmental agencies. Since legal systems differ from country to country, OIML concerns itself with broad principles, rather than minutiae, and works towards international harmonization in legally required measurements.

Aims and scope of OIML

The aims of OIML are:

- to determine the general principles of legal metrology;
- to maintain an information centre on national arrangements for measurements subject to legal metrology;
- to study problems of legal metrology with a view to finding internationally unified solutions;
- to establish model draft laws relating to measuring instruments and their use;
- to establish draft organisational plans for a service of legal metrology;
- to determine the characteristics of measuring instruments necessary for approval of their use in legal metrology;
- to promote closer relations between weights and measures departments in member states.

The above aims are pursued by pilot secretariats (SP) and their sub-units reporting secretariats (SR), each covering a defined technical area and working by both correspondence and discussion at international meetings. Though originally concerned with the measurement requirements of commerce, the scope of OIML now extends beyond weights and measures to measurement problems connected with health, safety and environmental protection; the OIML activities of main interest to chemists lie in SP 17, 18 26, 27 and 30.



Author John Cox was a government scientist in the UK from 1949 to 1986. He served at the Chemical Research Laboratory, National Chemical Laboratory and National Physical Laboratory and was a member of the UK Scientific Mission in Washington DC, USA. He was a titular member of the IUPAC Commission on Thermodynamics, chairman of the Subcommittee on Thermodynamic Tables and member of the Subcommittee on Reference Materials. He was also a member of the OIML Pilot Secretariat on Reference Materials.

Brief history and structure of OIML

The concept of an OIML was elaborated shortly before World War II by a provisional committee guided by M. Marcel Costamagna. The onset of war prevented progress for many years, but a constitution was established by 1955, and with its ratification by the 16th adherent (Norway) the organization was formally inaugurated in 1958. There are currently 51 member states.

The constitution lays down that OIML shall comprise:

- an International Conference on Legal Metrology;
- an International Committee of Legal Metrology;
- an International Bureau of Legal Metrology.

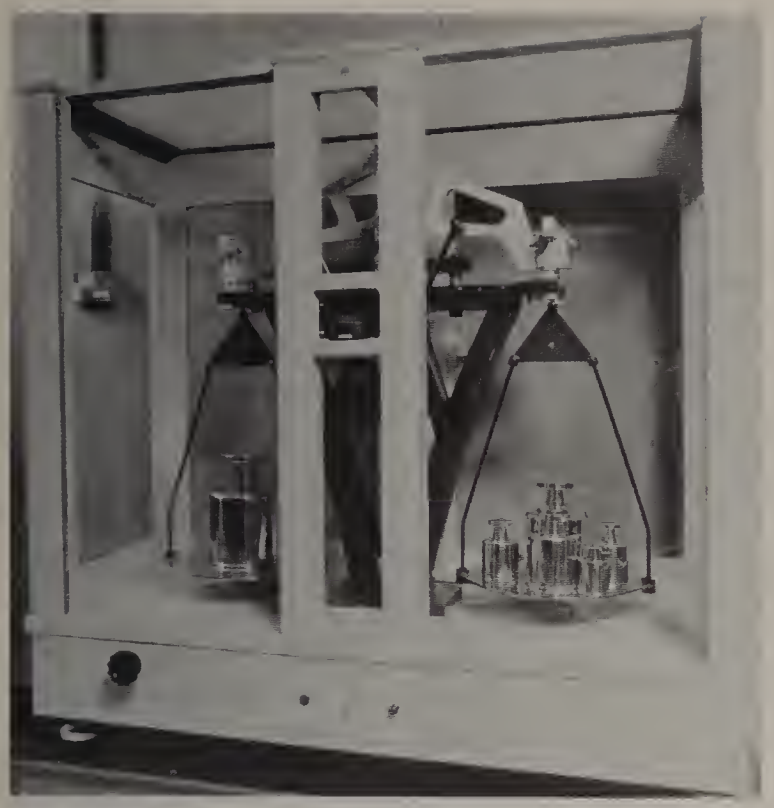
The conference is required to meet at least every six years, although the average interval to date has been four years; the most recent conference (1984) was in Finland and the next will be in Sydney, Australia, October 1988. At a given conference, each member state is entitled to three delegates, of whom one at least should be a serving official from a department responsible for weights and measures. Beyond these delegates of member states, non-voting "corresponding members" may also attend a conference; these persons may represent either international bodies (for example, Dr A. K. Covington represented IUPAC at the 1984 conference) or states (of which there are currently 27) which have expressed an interest in OIML but have yet to sign the Convention.

The Committee (CIML), consists of one government-appointed representative from each member state, together with any adviser whom the president may invite. The main functions of CIML are to determine policy, prepare long-term plans, and direct and approve technical activities.

The Bureau (BIML) in Paris has organizational and secretarial (including publishing) responsibilities that are entirely analogous to those of the IUPAC secretariat in Oxford. Indeed, the two bureaux are of similar size.

Whilst some strong parallels between OIML and IUPAC exist, the outlooks and aims of the two organizations are quite distinct; thus, OIML is more directly oriented towards the metrological needs of national governments and less towards the orderly development of scientific nomenclature and methodology. Moreover, a recommendation from OIML has distinctly more clout than can be claimed for a IUPAC recommendation, as explained in the next section.

Roll-call of OIML's member states and an historic gallon measure at BIML, Paris.



Pilot Secretariat 8 is concerned with weights.

OIML pilot secretariats (SP) extant in 1987

SP 1	Terminology
SP 2	Legal metrology, general
SP 4	Measurement of length, area, angle
SP 5S	Static measurement of volumes of liquids
SP 5D	Dynamic measurement of volumes of liquids
SP 6	Measurement of gas
SP 7	Measurement of mass
SP 8	Weights
SP 9	Measurement of density
SP 10	Measuring instruments for vehicles
SP 11	Measurement of pressure
SP 12	Measurement of temperature and heat
SP 13	Measurement of electrical and magnetic quantities
SP 14	Acoustics and vibration
SP 15	Optics
SP 16	Ionizing radiation
SP 17	Measurement of pollution
SP 18	Measurement of characteristics of food products
SP 19	Measurement of characteristics of materials
SP 20	Prepackaged products
SP 21	Metrological characteristics of measuring instruments
SP 22	Principles of metrological control
SP 23	Methods and means used for certification of verification devices
SP 26	Measuring instruments used in the field of health
SP 27	General principles for the use of reference materials
SP 30	Physico-chemical measurements
SP 31	Teaching of metrology

The output of OIML

The end-product of the deliberations of a given pilot secretariat will be a document the successive drafts of which will have been subject to a process of refinement by its members, both "participating" and "observing", over a period of years. The draft document will then be put before the conference, and, if approved by a minimum of four-fifths of the votes cast, will become an international recommendation (RI). By mid-1987, 73 RIs had been issued, ranging from "Cylindrical weights from 1 g to 10 kg (medium accuracy class)" to "Requirements concerning pure gases CO, CO_2, CH_4, H_2, O_2, N_2 and Ar intended for the preparation of reference gas mixtures".

Member states are morally obliged to implement as far as possible an international recommendation, so the need for tightness in the drafting and thorough discussion by member governments before a vote is taken at conference will be self-evident. From time to time the BIML undertakes a survey of the extent to which member states have implemented RIs: although an implementation rate of 100% has been achieved for some of the earlier RIs, much lower rates are evident for recent RIs, due to "the law's delay".

Additional to its international recommendations, OIML issues general guidelines in the form of international documents. To date 16 have been issued, ranging from "Law on metrology" to "Principles of assurance of metrological control". Also, OIML was a member of the quadripartite team which prepared the first edition

OIML produces international recommendations for the performance of commercial measuring equipment. Here a petrol pump is being checked for its electromagnetic immunity.

Recent International Documents

The first editions of the following two documents were published by OIML in 1987:

- Hierarchy scheme for instruments measuring the viscosity of liquids (International document No. 17).
- General principles of the use of certified reference materials in measurements (International document No. 18).

of the "International vocabulary of metrology". An information publication *Bulletin de l'Organisation Internationale de Métrologie Légale* is issued quarterly by BIML (ISSN 0473–2812).

Besides its committee work leading to the publication of recommendations or documents, OIML is directly involved in the furtherance of legal metrology, especially in developing countries. This is achieved through organization of seminars, help in establishing training courses and provision of guide books. Often this aid is provided via other international or regional bodies, such as UNESCO (United Nations Educational, Scientific and Cultural Organization), UNIDO (United Nations Industrial Development Organization), the Commonwealth Science Council, and the African Regional Standardization Organization.

Interactions between OIML and IUPAC

IUPAC has been in liaison with OIML for some years, but the liaison has taken the form of exchange of information rather than the establishment of joint work programmes. Given that there are several technical areas of overlap between OIML and IUPAC, a closer cooperation would seem to be desirable, and indeed the necessary goodwill already exists. However, the practical realization of a cooperative programme is by no means easy within the constraints of budgets, available expertise, and differing objectives. Furthermore, some technical areas are of concern not merely to the two bodies, but to other international organizations, as well.

The UK National Weights and Measures Laboratory located at Teddington, Middlesex.

The complexity of the situation is exemplified by attempts to define a modern scale of pH, where groups in IUPAC, OIML and the International Electrotechnical Commission have been working concurrently and independently. IUPAC has made one set of recommendations on the measurement of pH of aqueous solutions and OIML has made another: a second round of discussions has now taken place, with the aim of achieving harmony.

To expose more fully some areas where collaboration between OIML and IUPAC could be beneficial, the titles of OIML's current projects with a chemical flavour are given below.

- Within SP 17
  - Gas chromatography–mass spectrometer for analysis of organic pollutants in water.
  - Atomic absorption spectrophotometers for measuring metal pollutants in water.
  - Gas chromatographs for measuring pesticide and toxic substances pollution.
  - High-performance liquid chromatographs for measuring pesticide and toxic substances pollution.
  - Portable instruments for assessing airborne pollutants arising from hazardous wastes.
- Within SP 18
  - Polarimetric saccharimeters.
  - Refractometers for measuring the sugar content of fruit juices.
- Within SP 26
  - Reference materials for calibrating blood counters.
- Within SP 27
  - Methods of testing the homogeneity of powdered and solid certified reference materials.
  - General principles and methods of certification of reference materials.
  - Use of certified reference materials for spectrophotometer calibration.
- Within SP 30
  - pH measurement. Intercomparison.
  - pH scale for aqueous solutions.
  - pH and ion measurements. Measuring methods.
  - Methods of conductivity measurement of electrolytic solutions.
  - Verification of thermogravimetric devices for measuring the moisture content of solids.

Methods and means for the verification of instruments measuring the mass concentration of pollutants in air.

Bureau International de Métrologie Légale,
11, rue Turgot,
75009 Paris,
France.

Telephone: +33 (1) 48 78 12 82
or
+33 (1) 42 85 27 11
Telex: SVPSV 660870 F ATTN OIML

President of OIML: Mr K. Birkeland (Norway)

Director of BIML: Mr B. Athané

Bernard Athané, Director of BIML.

Commission & Committee News

BOSTON

Restructuring of Applied Chemistry Division

Environment, agriculture and technology are to be the new sub-divisions under the restructuring of the division.

Applied Chemistry Division President Dr Phil Kearney expressed his grave concern about the image and role of the division within the Union and the lack of representation on the Bureau, Executive Committee, Council or any other major committee. After considerable discussion a new structure for the division was proposed. It was agreed to form three sub-divisions: environment, agriculture and technology.

The environment sub-division would supervise the work of the Commissions on Atmospheric Chemistry (VI.4) and Water Chemistry (VI.6). The agriculture sub-division would supervise the work of the Commissions on Food Chemistry (VI.1), Oils, Fats and Derivatives (VI.3) and Agrochemicals (VI.5: formerly Pesticides). The technology sub-division would be concerned with the work of the Commission on Biotechnology (VI.2). Each sub-division would be allocated one or more coordinators to keep a watch on the work of the commissions to stimulate new ideas and to prevent duplication of effort.

In spite of the criticism of the work of some of the commissions by Prof. Koptyug, all the corresponding members advise that good progress and considerable contributions are being made in many fields of applied chemistry. However, it was emphasized that early publication and completion of projects must be given a high priority.

One notable "out-reach" programme in an advanced stage of preparation is that between the Commission on Pesticide Chemistry and pesticide chemists in the People's Republic of China. This programme is concerned with the implications of increased pesticide usage in China. A workshop on the subject will be held at Nankai University, 26–28 August 1988.

The reformed Commission on Water Chemistry, now well established, held a successful workshop in Frankfurt, FRG, during October 1986 resulting in the publication of the proceedings on "Removal of chlorinated hydrocarbons and heavy metals from waste waters by advanced treatment systems". The same commission is to cooperate actively and represent the division at the International Conference on Aquatic Toxicity Reduction and Control in Nashville, USA.

Last, but not least, the revitalized Commission on Biotechnology organized a special IUPAC symposium on "Biotechnology in chemistry" at Boston during the general assembly. The symposium was extremely informative and well attended.

Members of the Applied Chemistry Division Committee continued to liaise with other divisions

About 100 chemists attended the "Biotechnology in Chemistry" symposium (see May 1988 issue of *CI*, page 102).

on matters concerned with reference materials, nomenclature and symbols, the teaching of chemistry and the editorial boards. There has also been active involvement with the International Organization for Standardization not only on draft proposals for standards but also on the harmonization of collaborative studies.

Finally, it was agreed that every effort should be made to ensure that all division members including national representatives should be "active" and, where necessary, adequate laboratory facilities should be available to make a practical contribution to the projects of the commissions.

The next meeting of the committee will be held in London, UK, 9–11 December 1988.

Lewis Coles

New books and maybe a newsletter

The Commission on Thermodynamics (I.2) and its subcommittees on Thermodynamic Tables and on Transport Properties met in Boston, 22–24 August 1987 to discuss ongoing activities, to decide on novel activities and to plan future projects.

One field of work of the commission is definitions and nomenclature in chemical thermodynamics. The project on definitions of activities and related quantities is expected to be completed during 1988 so that a document can be prepared for publication during 1989. It is intended to supplement *Quantities, Units and Symbols in Physical Chemistry* which appeared in the autumn of 1987. Symbols discriminating between intensive thermodynamic properties have been discussed but it was felt that possible gains of introducing a new set of symbols did not warrant the large efforts needed and no further action will be taken at the present. Likewise the project on symbols and nomenclature for the thermal functions has been put to rest for the time being.

An important activity of the commission and its subcommittees is the preparation of authoritative texts dealing with various aspects of experimental thermodynamics. It was decided in Boston that the preparation of Volume 2 of *Experimental Chemical Thermodynamics* dealing with measurements of transport properties of fluids should be started. The response of the scientific community to an enquiry about the updating of the comprehensive volumes on *Experimental Thermodynamics* Vol. 1: *Calorimetry of Non-reacting Systems* (1968) and Vol. 2: *Experimental Thermodynamics of Non-reacting Fluids* (1975) was not positive enough to motivate the preparation of new editions. The commission decided to investigate if there was more interest in the preparation of a volume dealing with solution calorimetry. P. A. G. O'Hare will report at the next commission meeting about the response to such a project.

The *Journal of Chemical Thermodynamics* under the joint editorship of M. L. McGlashan and P. A. G. O'Hare is in good shape while the future of the *Bulletin of Chemical Thermodynamics* is uncertain. However, a need is felt for an informal method of information exchange among thermodynamicists and the possibilities of starting a *Current Affairs Newsletter on Thermophysical and Transport Properties* are being explored.

The subcommittee on thermodynamic tables continues its projects on pure fluids. The work on all of the fluids named in the project (fluorine, oxygen, methanol, ethylene and sulphur hexafluoride) is almost complete from a technical point of view and the books are under publication or in the final stage of preparation. Suggestions are invited for new fluids to be added to the project. The project dealing with liquid–vapour equilibria of *n*-alkanol mixtures will be continued. New projects on the critical compilation of vapour–liquid critical properties and of heat capacities of pure liquids have been started. In view of the increasing exchange of data in non-tabulated forms the name of the subcommittee was changed to Subcommittee on Thermodynamic Data.

The subcommittee on transport properties of fluids continues its active work in the three selected areas of interest:

- definite correlation of the transport properties of

Gerd Olofsson, Secretary of the Commission on Thermodynamics.

gases with emphasis on data for the chemical industry;

- internationally available data bank on recently published and still unpublished experimental data on transport properties;
- standard of viscosity and thermal conductivity.

Ten publications by subcommittee members related to the above topics have appeared in print and seven are in press.

The next commission meeting will be held on 27–28 August 1988 in Prague, Czechoslovakia, immediately before the 10th International Conference on Chemical Thermodynamics.

Gerd Olofsson

Opinions please:
Glossary of terms used in physical organic chemistry

The Commission on Physical Organic Chemistry (III.2) is working on a revised and extended edition of the *Glossary of terms used in physical organic chemistry*. This glossary was edited by the late Victor Gold and published in *PAC*, Vol. 55, No. 8, pp. 1281–1371, 1983.

The commission would like the opinions of the scientific community to be taken into consideration in this revision. All scientists interested in the project are invited to contribute.

Comments and criticism on the first edition of the glossary, suggestions for the revision, and copies of correspondence exchanged with Victor Gold on this matter should be mailed to the Chairman of Commission III.2, Prof. Paul Müller, Department of Organic Chemistry, University of Geneva, 30, quai Ernest Ansermet, CH-1211 Geneva 4, Switzerland.

Evaluation of immunochemical methods

When the Commission on Food Chemistry (VI.1) met at Boston in August 1987 it gave priority to a project on the evaluation of immunochemical methods. The commission also reviewed the progress of its projects since the previous general assembly.

In the year leading up to the Boston General Assembly 13 new projects were initiated, and 8 were completed. These projects focused on analytical method development, validation and check sample programmes. Three projects were given tentative approval for the following year including the development of guidelines for the evaluation of immunochemical methods for aflatoxin in foods and feeds.

The commission is exploring the feasibility and desirability of establishing a working group on immunochemical methods to liaise with the Commission on Biotechnology and assist other working groups with projects involving immunological techniques.

Potential working groups on vitamin analysis, food irradiation and food packaging materials were also considered.

After many active years of service two titular members (Drs Korgh and Steyn) and two associate members (Drs Jemmali and Kubacki) retired. New titular members are Dr Conacher (Vice-Chairman) and Dr McWeeny (Publications Coordinator). Dr Rosenthal was appointed Chairman of the Working Group on the Effects of Processing and Storage on Food Quality.

The next meeting of the commission will be held in Bilthoven, Netherlands, 17–19 October 1988.

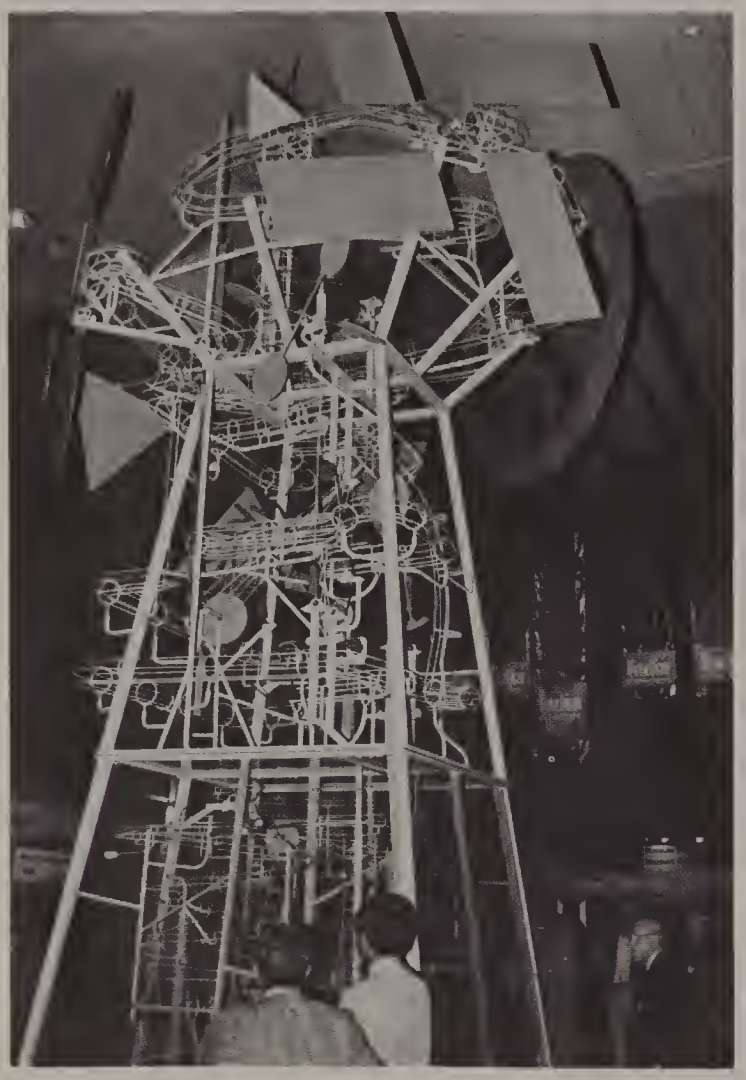
Douglas L. Park

Oils, fats and derivatives

A combined attendance of over 40 members at the two 1988 meetings of the Commission on Oils, Fats and Derivatives (VI.3) reflects the high level of interest maintained in the commission's activities. The two meetings were held in Münster, FRG and Boston, USA. Applied Chemistry Division President Dr Phil Kearney, who attended the opening session of the meeting in Boston, congratulated the commission for the publication of the 7th edition of *Standard Methods for the Analysis of Oils, Fats and Derivatives* (see page 29 of the January 1988 issue of *CI*).

Following the 1987 meetings a total of 12 new methods of analysis are being made available for publication as the first supplement to the 7th edition. This indicates the amount of work accomplished by the commission since the preparation of

Audiokinetic fascination



With balls and pulleys and cogs and chains, it jingled, it jangled, it clicked and it clucked.

It was an audiokinetic sculpture called *Archimedean excogitation* by George Rhoads (1987) and it certainly fascinated Professors Fluck, Jeannin and Peshev (see p. 129) and many other General Assembly participants when they visited the Boston Science Museum.

Ray Bates (Division VI Committee) compared it (a little unfairly?) to IUPAC: "It is complicated, it moves but it doesn't actually do anything".

the 7th edition. The supplement should be published by the end of 1988.

Four of the methods of analysis have already been published in *PAC*; determination of butyric acid, total and free hexane in oilseed cakes, hexane residues in extracted oils. Of the remaining methods, two (tocopherols by HPLC and determination of copper, iron and nickel by AAS) have been submitted to the publishers and the others are practically ready for publication. These include the determination of 2-thiobarbituric acid values (colorimetric methods), *n*-3 and *n*-6 fatty acids in vegetable oils (by capillary column GLC) and antioxidants (by HPLC).

Welcome publicity of the work of the commission appeared in two German newspapers during the course of the meeting in Münster, the publicity taking the form of detailed reports of the commission's activities (with accompanying group photographs of members of the commission assembled in Münster).

It was agreed that the commission should organize an IUPAC Workshop on the Analysis of Oils and Fats. The workshop will take place in the laboratories of the University of St Andrews, Scotland, from 23–24 August 1988 (see page 3 of the January 1988 issue of *CI*). The workshop will follow the 1988 commission meeting which is also to be held at the university (16–18 August 1988).

W. Dennis Pocklington

Biophysical chemistry

Developments in molecular biology and its applications have led to a situation where it is not always meaningful to distinguish between the disciplines of chemistry and biology. In this context the question has arisen whether IUPAC has given enough attention to these developments. For example, physico-chemical concepts and techniques are widely applied in work on living systems. But are existing IUPAC recommendations, guidelines and data compilations adequate for use in such work?

Problems of this kind were considered by a working party appointed by the Physical Chemistry Division at the Lyon General Assembly in 1985 (see pp. 2–3, June 1986 issue of *CI*). This led to the formation of a steering committee for biophysical chemistry during the Boston General last August. So far six members have been appointed: R. A. Alberty (vice-chairman, USA), B. Heinritz (GDR), D. Thomas (France), and I. Wadsö (chairman, Sweden). Two more members will be appointed.

Prof. Ingemar Wadsö, Chairman of the Steering Committee for Biophysical Chemistry, at the Boston General Assembly.

The committee will initiate projects which will be conducted by separate working parties. Members of the Union's commissions and divisions will be invited to join the working parties but the committee will count, to a large extent, on participation by biophysical chemists who have not previously been connected with IUPAC. It was felt that IUPAC needs an influx of new people with specialist knowledge in different areas of biophysical chemistry.

The following three working parties have started their work:

- *Protein stability* (Coordinator: B. Heinritz). Protein stability is of critical importance in basic and applied biothermodynamics. There appears to be an urgent need for compilation of data related to this field, in particular for use in biotechnology.
- *Electrochemical biosensors* (Coordinator: K. Niki). The interest in work on and use of electrochemical biosensors is increasing rapidly in basic work, in biotechnology and in clinical analysis. There is a need for monographs on topics like redox mediators and tailored electrodes for redox proteins and for the design, installation and configuration of *in vivo* biosensors. Further, standardized measurement procedures should be recommended.
- *Guidelines for preparation and characterization of and terminology for vesicles* (Coordinator: L. Ter-Minassian-Saraga). Vesicles are closed lipid bilayers which are suspended in aqueous solutions. In basic work such structures are often employed as models for biological membranes, and in biotechnology they are used, for example, as protecting carriers for water-soluble biological molecules. Guidelines for preparation and characterization of vesicles and recommendations for terminology in this field will be prepared.

Comments and suggestions relating to the work of the committee are invited from any interested individual and can be sent to the Committee Chairman, Prof. Ingemar Wadsö, Thermochemistry, Chemical Center, University of Lund, PO Box 124, S-221 00 Lund, Sweden.

Publications

Solubility Data Series

Methane

Methane is Volume 27/28 of the *Solubility Data Series* (see *CI*, Vol. 8, No. 5, pp. 25–29, 1986). It is a near-800-page double volume which compiles and evaluates data on the solubility of methane gas in water, seawater, aqueous electrolyte solutions, mixed solvents, hydrocarbons, alcohols, ethers, ketones, carboxylic acids, halocarbons, and other liquids and liquid mixtures at all temperatures and pressures based on papers found in the literature through mid 1985.

The double volume on methane completes the collection of solubility data on the first four members of the alkane hydrocarbon series of composition C_nH_{2n+2} supervised by the Commission on Solubility Data (V.8). Already published are

Solubility data in the alkane hydrocarbon series are useful for scientists and engineers working with industrial fuel and feed-stock gases. Volume 27/28 compiles and evaluates data on the solubility of methane gas in water, seawater, mixed solvents, hydrocarbons and other liquids and liquid mixtures. (*Photo courtesy BP.*)

Volume 9 on ethane, and Volume 24 on propane and the butanes, both edited by W. Hayduk.

The volumes present a useful set of solubility data for the scientists and engineers working with industrial fuel and feed-stock gases, components of natural gases found in many areas of the world. Important additional sources of methane include recovery from coal beds, from the decomposition of organic materials, and as a byproduct of various petroleum refining processes. Many recent methane solubility data come from papers on tertiary oil recovery, bitumen and coal utilization, synthetic fuel preparation, and on deep-earth geological problems.

As with the earlier volumes in the series, the volume references present all known solubility data in their original form. For systems for which there are sufficient data, an evaluation is prepared with graphical and fitted equation representations of the recommended or tentative data. Thus, all of the original data are available in one place to compare with new data, and to use with better evaluations procedures as they are developed. The components of all systems are indexed by IUPAC, *Chemical Abstracts*, and common names. There is a *Chemical Abstracts* registry number index of the component substances and an author index.

The double volume is edited by H. L. Clever and C. L. Young and published by Pergamon Press, Oxford, UK, 1987. xviii + 783 pp. ISBN 0 08 029200 3. Price GBP 128.00/USD 240.00.

Mercury

An element of obvious importance, mercury is also hazardous in the environment and corrosive to many materials. A knowledge of its solubility is inestimable in addressing problems concerning the metal's concentration in our surroundings.

Mercury in liquids, compressed gases, molten salts and other elements is Volume 29 of the series. The volume presents all relevant published data on the solubility of mercury published up to June 1986. It also includes values of Henry's constant and Ostwald coefficients for the systems concerned. The volume is aimed at environmental scientists, inorganic, physical and analytical chemists, and scientists and technologists concerned with mercury and its compounds.

The contents includes compilations and critical evaluations of mercury in the following solvents: water, seawater, aqueous electrolyte and non-electrolyte solutions, hydrocarbons, alcohols, ethers, carboxylic acids, halocarbons, nitrobenzene, compressed gases, molten and solid salt systems and other elements.

Volume 29 is edited by H. L. Clever and published by Pergamon Press, Oxford, UK, 1987. xii + 255 pp. ISBN 0 08 035935 3. Price GBP 64.00/USD 120.00.

Alkali metal and ammonium halates

Alkali metal halates, ammonium iodate and iodic acid is Volume 30 of the series. It presents compilations and critical evaluations of reported solubility data for the title compounds published up to mid-1984. These compounds have an important place in the history of analytical chemistry. Practical applications include their use in pyrotechnics and the paper pulp industry.

The volume includes two BASIC computer programs which allow the calculation of solubilities at any temperature. Volume 30 is intended for inorganic, analytical and physical chemists, and scientists and technologists in the paper pulp and related industries.

Contents include an introduction to the solubility of solids in liquids together with a compilation and evaluations of solubility data for aqueous, non-aqueous and multi-component systems for chlorates, bromates and iodates of lithium, sodium, potassium, rubidium and caesium, together with ammonium iodate and iodic acid.

The volume is edited by H. Miyamoto and M. Salomon and published by Pergamon Press, Oxford, UK, 1987. xiv + 510 pp. ISBN 0 08 029210 0. Price GBP 64.00/USD 120.00.

Quantities, units and symbols in physical chemistry

The first edition of the *Manual of symbols and terminology for physicochemical quantities and units*, known as the Green Book was prepared for publication on behalf of the Physical Chemistry Division in 1969. *Quantities, units and symbols in physical chemistry* is a direct successor to the first edition.

The first edition had as its objective, clarity and precision, and wider agreement in the use of symbols, by chemists in different countries, among physicists, chemists and engineers, and by editors of scientific journals. The second and third editions of the Green Book were revisions to take account of various developments in the Système International d'Unités (SI), and other developments in nomenclature.

The 1988 edition is a substantially revised and extended version of the earlier editions, with a slightly simplified title. These extensions include some of the material previously published in appendices, all the newer resolutions and recommendations on units by the Conférence Générale des Poids et Mesures (CPGM), and the recommendations of the International Union of Pure and Applied Physics (IUPAP) of 1978 and the International Organization for Standardization. The table of physical quantities has been extended to include

defining equations and SI units for each quantity and the style has been changed from being a book of rules towards being a manual of advice and assistance for the day-to-day use of practising scientists.

Outline of contents: historical introduction; physical quantities and units; tables of physical quantities; definitions and symbols for units; recommended mathematical symbols; fundamental physical constants; conversion of units; references; index of symbols; Greek alphabet; pressure conversion factors; energy conversion factors.

The book was edited for the Commission on Physicochemical Symbols, Terminology, and Units by Ian Mills, Tomislav Cvitas, Klaus Homann, Nikola Kallay and Kozo Kuchitsu and published by Blackwell Scientific Publications, Oxford, UK, 1988. ix + 134 pp. ISBN 0 632 01773 2. Price GBP 19.95/ USD 32.50.

Abbreviated list

The *Abbreviated list of quantities, units and symbols in physical chemistry* is based on the more comprehensive book described above. The laminated list is intended as a ready reference to the symbols most frequently used by authors, teachers and students in chemistry and related disciplines.

It is an invaluable information source on the internationally recommended symbols for the most important physical quantities and units used by chemists and includes such subjects as: base SI units and physical quantities, SI prefixes, SI-derived units with special names and symbols, recommended symbols for commonly used physical quantities, units outside the SI and values of some fundamental constants.

The list was prepared for publication by K. H. Homann and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1987. 4 pp, laminated card. Available only in packs of 10 or 50. 10 pack GBP 15.00/USD 29.50, ISBN 0 632 01774 0. 50 pack GBP 67.50/USD 132.50, ISBN 0 632 01775 9.

Analytical nomenclature

Until 1977, all those who sought the officially recommended analytical nomenclature adopted by IUPAC were obliged to read individual reports as they appeared, from time to time, in *PAC*. A great improvement was achieved that year with the publication of the *Compendium of Analytical Nomenclature* (known as the Orange Book) by IUPAC through the efforts of H. Irving, T. West and H. Freiser.

The compendium consisted of a reprinting of the 23 recommended analytical nomenclature reports then available along with a comprehensive index. This task brought into sharp focus the significant gaps still existing in essential analytical nomenclature and has since helped to guide new nomenclature projects.

The Analytical Division Committee decided to launch the preparation of a new, more complete and concise "Manual of Analytical Nomenclature", but this has still to be achieved. Nevertheless, progress has been made, resulting in the second edition of the Orange Book. The second edition differs from the original compendium by inclusion of the additional nomenclature reports that have since appeared.

Definition of a pile-up

The following definition occurs on page 235 of the second edition of the *Compendium of Analytical Nomenclature*:

PILE-UP
The processing by a *radiation spectrometer* of pulses resulting from the simultaneous *absorption* of independent *particles* or *photons* in a *radiation detector*. As a result, they are counted as one single *particle* or *photon* with energy between the individual energies and the sum of these energies.

In addition, the material has been reorganized along the lines of the comprehensive outline of the manual developed in 1978 and by retention of only the essentials of the original reports. The following is an outline of the contents:

- Presentation of the results of chemical analysis
- Solution thermodynamics
- Recommendations for terminology to be used with precision balances
- Recommendation for nomenclature of thermal analysis
- Recommendation for nomenclature of titrimetric analysis
- Automatic analysis
- Electrochemical analysis
- Analytical separation processes
- Spectrochemical analysis
- Other optical methods
- Recommendations for nomenclature of mass spectrometry
- Diffraction methods
- Magnetic methods of analysis
- Kinetic methods of analysis
- Recommendations for nomenclature of radiochemical methods
- Surface analysis.

Compendium of Analytical Nomenclature: Definitive rules 1987 *was prepared for publication by*

Henry Freiser and George H. Nancollas and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1987. vii + 279 pp. ISBN 0 632 01907 7. Price GBP 32.00.

Reference materials

Science and technology is maintained, in large part through the application of numerical data obtained by measurement. The accuracy of the data depends, to a large extent, on the reliability of measurement and a common frame of reference.

The common frame of reference for the base system of units recognized internationally is the *Système International d'Unités* (SI) and the means to realize this system and the definitions of units, as well as the methods used to realize them, are the responsibility of the Comité International des Poids et Mesures (CIPM) working with various international scientific unions and national standards laboratories. It is necessary to be able to transfer these units from standards laboratories to working laboratories which contain various measuring systems and instruments. Such apparatus often yields results whose uncertainty of measurement and limits of error cannot be established without the employment of materials with known properties. The materials used for this purpose are called *reference materials.*

The Reference Materials Committee of the International Organization for Standardization (ISO–REMCO) have considered the use of terms and definitions in connection with reference materials and their recommendations have been considered by the four international organizations concerned with metrology — the International Bureau of Weights and Measures (BIPM), the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO) and the International Organization for Legal Metrology (OIML).

The agreed definitions of these terms are contained in the International Vocabulary of Basic and General Terms in Metrology. The terms and definitions which are of concern in this publication are based on their definitions, except that the word 'standard' has been replaced by 'reference material' in accordance with the recommendations of ISO–REMCO.

Types of reference material

In considering the position of different types of reference materials in the metrological hierarchy, we include in the classification the descriptives *primary, secondary*, and *working* as used for the designation of the classes of reference materials in this publication. A *primary reference material* has the highest metrological quality in a specified field. A *secondary reference* material is one whose value is fixed by comparison with a primary reference material. The terms primary and secondary denote the position in the metrological hierarchy and a secondary reference material is not necessarily of inferior quality to a primary reference material.

A *working reference material* is one which, usually calibrated against a primary or secondary reference material, is used routinely to calibrate or check measuring instruments. A primary or secondary reference material may be used as a working reference material when high accuracy is required. Working reference materials are primarily used for three purposes;

1. to calibrate instruments to ensure that the numerical values obtained for a measured

Left
Editor Dr Ken Marsh who is Director, Thermodynamics Research Center, Texas A&M University, USA and Chairman of the former Commission on Physicochemical Measurements and Standards.

Right
Dr E. (Bandi) Juhász, one of the collators of the volume on reference materials and Chairman of the Subcommittee on Reference Materials in Chemistry.

A report on the "New Subcommittee on Reference Materials" appeared in the July 1987 issue of *CI* (pages 142–144)

property are accurate within the uncertainty limits;
2. to check the performance of an instrument or its operator;
3. to provide a means of quality control.

Some materials have their properties certified by, or their certification is traceable to (as defined in reference 3), an authoritative national or international organization, agency, or laboratory and these are called *certified reference materials* for the purpose of these recommendations. When available, certified reference materials have advantages over uncertified reference materials because uncertainties in the property value are defined.

Certified reference materials also provide a convenient method for the transfer of a value of a property from a standardizing laboratory to a working laboratory and for intercomparisons between standardizing laboratories and working laboratories. Some pure materials which are not certified are used for the realization of certain properties. We have sometimes recommended the use of such uncertified materials which may either require purification by the user or be available in adequate purity from reliable sources. In these cases the estimated uncertainty given in the recommendation is based upon an analysis of the published data, but the actual value may have a higher uncertainty depending on the specific nature of the impurities present in the particular sample.

Recommendations

A number of recommendations have been published previously in *PAC. Recommended Reference Materials for the Realization of Physicochemical Properties* brings together most of these recommendations: some of them remain unchanged while others have been revised or expanded, and a few deleted.

The recommendations are based on information from the literature, from correspondence with scientists in each discipline, and from comments solicited from metrological bodies, national standards laboratories, manufacturers and suppliers. The values given result from a careful evaluation by the collators and contributors and the recommendations have been referred to the appropriate IUPAC bodies and national standards laboratories for their comment.

The introduction to each section is not intended to be exhaustive but reflects the state of the art for the measurement under consideration at the completion date. Many of the recommendations include a brief outline of the experimental methods available and the advantages and disadvantages of each method. The majority of the recommendations include the following information for each recommended reference material: physical property, units, range of variables, physical state(s) within range, the names of contributors, intended usage, sources of supply, methods of preparation, pertinent physicochemical data, and references.

The book contains the following sections (collators are shown in brackets):

1. Introduction
2. Density (G. Girard)
3. Surface tension (D. V. S. Jain)
4. Viscosity (W. Künzel, H. F. van Wijk and K. N. Marsh)
5. Pressure–volume–temperature (D. Ambrose)
6. Distillation-testing of columns (E. F. G. Herington)
7. Relative humidity of air (W. Künzel)
8. Temperature (D. Ambrose and L. Crovini)
9. Enthalpy (A. J. Head and R. Sabbah)
10. Thermal conductivity (B. Le Neindre)
11. Electrolytic conductivity (E. Juhász and K. N. Marsh)
12. Permittivity (K. N. Marsh)
13. Potentiometric ion activities (E. Juhász)
14. Optical rotation (B. Coxon)
15. Optical refraction (A. Feldman and I. H. Malitson)
16. Reflectance (H. Feuerberg, D. Gundlach and H. Terstiege)
17. Wavelength and transmittance (R. W. Burke and R. A. Velapoldi)
18. Relative molecular mass (K. Marsh)

Recommended reference materials for the realization of physicochemical properties *is edited by K. N. Marsh and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1987. x + 500 pp. ISBN 0 632 01718 X. Price (cloth) GBP 55.00/USD 76.50.*

Oxygen thermodynamic tables

The Thermodynamic Tables Project was inaugurated in 1963 by the Commission on Thermo-

dynamics and Thermochemistry of the Division of Physical Chemistry with the object of compiling internationally agreed values for the equilibrium thermodynamic properties of liquids and gases of interest to both scientists and technologists.

The range covered for each fluid is that for which there exist reliable experimental data, and the agreed values are issued as tables upon the basis of which users may produce equations suited to their own special requirements, if the wide-ranging equations given are not appropriate for their purposes.

Tables on argon, ethylene, carbon dioxide, helium, methane, nitrogen, and propylene have already appeared based on these principles. *International thermodynamic tables of the fluid state, Volume 9: Oxygen* is the next in this series.

For important fluids for which the existing data are inadequate to form the basis of extensive tables using the above criteria, a combination of experimental data and estimation is used to construct 'tentative' tables. The volume on chlorine was the first to appear in this series (see p. 23 of the August 1986 issue of *CI*).

The main part of Volume 9 consists of tables of the equilibrium thermodynamic properties of oxygen for both the gas and liquid phases and along the saturation curve and the melting curve. The limits of the tables are 54 to 300 K for pressures up to 80 MPa.

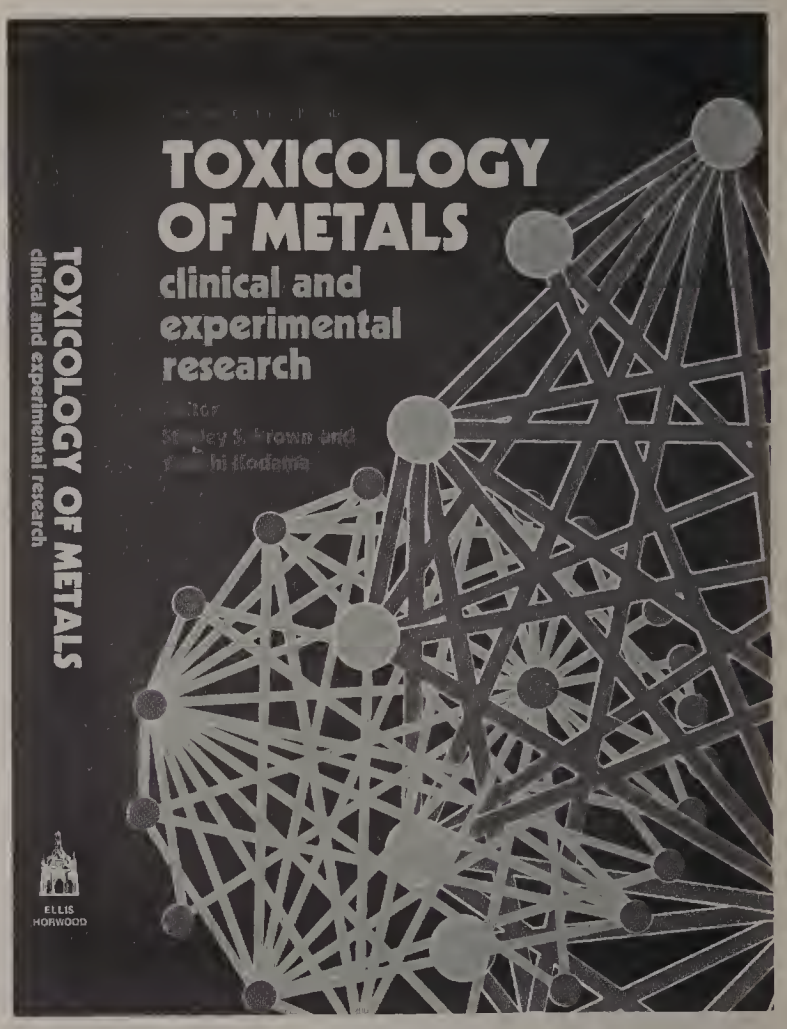
The properties listed are volume, entropy, enthalpy, isobaric heat capacity, compression factor, fugacity–pressure ratio, Joule–Thomson coefficient, ratio of heat capacities and speed of sound as functions of pressure and temperature; and pressure, entropy, internal energy and isochoric heat capacity as functions of density and temperature.

The text gives a critical assessment of the accuracy of all the available experimental data and gives comparisons of the tables with the experimental data. The equations which were used to prepare the tables are given in a form suitable for computer programming.

International thermodynamic tables of the fluid state, *Volume 9: Oxygen was written and compiled by W. Wagner and K. Marjorie de Reuck and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1987. xviii + 231 pp. ISBN 0 632 01476 8. Price GBP 34.50.*

Metal toxicology

Since its foundation in 1980, the University of Occupational and Environmental Health (UOEH), Kitakyushu City, Japan, has sponsored a series of international symposia on topics related to the field of occupational health. *Toxicology of metals: clinical and experimental research* contains the texts of 17 invited lectures and extended abstracts of 112 papers presented to the VIth UOEH International Symposium and IIIrd COMTOX on the Toxicology of Metals, held in Kitakyushu, Japan, 27–31 July 1986.



The COMTOX conferences are a series of IUPAC-sponsored conferences on chemical toxicology and clinical chemistry of metals. The joint UOEH and COMTOX meeting was a satellite symposium of the IVth International Congress on Toxicology, which was held in Tokyo during the preceding week.

Trace metals and metalloids

Barely a dozen trace metals are known to be essential to life and, of course, even these metals can exert toxic effects, depending upon the chemical form, dose, route of absorption, and a host of other factors. The other metallic elements are "non-essential" in a biochemical sense, but many of them are exceedingly important to modern industry.

It is a sad fact of life that the burgeoning industrialization of the past three or four decades, both in Japan and in other countries, has been accompanied by actual or suspected societal and health problems due to the toxic effects of certain metals. Some of these effects have been recognized for millenia, but nowadays, metal toxicology is highly relevant to the environment as well as the work place, and it is a subject of major importance to

physicians, scientists and technologists alike. The VIth UOEH Symposium and IIIrd COMTOX was intended to serve as a forum at which up-to-date facts, figures and ideas could be exchanged on selected aspects of the chemical, biochemical, environmental and clinical toxicology of trace metals and metalloids.

"It is a sad fact of life that the burgeoning industrialization of the past three or four decades . . . has been accompanied by actual or suspected societal and health problems due to the toxic effects of certain metals."

For the purpose of the proceedings, the invited and presented papers have been gathered together into two groups, corresponding to Parts 1 and 2 of this volume. Part 1 deals with some general aspects of the roles of trace metals in health and disease under three broad headings: essentiality and toxicity; interactions; monitoring and analysis. Part 2 describes some chemical and experimental studies of specific metals, which are considered under four headings: aluminium and "light elements"; lead, cadmium and "heavy elements"; chromium, nickel and "transition elements"; platinum, gold and "noble elements". Clearly, some papers present material which is relevant to more than one heading, but this is inevitable, because toxicology is inherently a multidisciplinary subject. It is interesting to highlight some of the topics which are discussed here and make a small comparison with the proceedings of the first and second meetings in the COMTOX series, which were held in 1977 and 1983, respectively.

Selenium features prominently here, but more as an essential element than a toxic one. It is obvious that there has been a steady growth in knowledge of its manifold biochemical functions since 1977; at the same time, it is difficult to assay accurately and precisely, and much remains to be learned about its speciation.

For other elements, there have been steady advances in our understanding of speciation, and its implications for cellular and organ toxicity. Interactions between metals, which were largely a matter of speculation in 1977, are now well documented, at least in experimental situations. There is little doubt that the stage is set for uncovering effects of this kind in man.

New analytical techniques

New and powerful analytical techniques have been a great stimulus to research in trace metal toxicology, and to making biological monitoring more

It is still too early to say whether the ability to make more or faster measurements of trace metals in biological materials will really lead to fundamental advances.

effective. Atomic absorption spectroscopy was well established in 1977, and by 1983, the scope and limitations of inductively coupled plasma spectroscopy were being explored. However, it is still too early to say whether the ability to make more or faster measurements of trace metals in biological materials will really lead to fundamental advances. There is a close parallel with the multi-channel profile in clinical chemistry which is technically efficient and commercially viable, but poor in uncovering disease when used in a screening mode.

In general, the 1977 and 1983 proceedings placed a strong emphasis on the pitfalls of trace metal analysis — means of avoiding contamination, and of assuring good sensitivity and specificity. Much less attention has been focused on these problems in the 1986 symposium, but there is a continuing need to establish inter-laboratory comparability, by developing reference methods and matrix reference materials.

An entirely new chapter of trace metal toxicology has been opened up in the past decade — that of aluminium, in the context of chronic renal failure. The topic was reviewed in 1983, and again at Kitakyushu, together with the reporting of new findings. It is intriguing that aluminium toxicity has not been as serious a problem to dialysis patients in Japan as in other countries, but uneven geographic impact was a recognized — and confusing — factor early on in the story. The link, if any, between aluminium and the onset or progression of Alzheimer's disease remains to be worked out; this is a field which demonstrates the value of ultramicroscopic studies of trace metal localization.

A light element which is only mentioned briefly in any of the three proceedings is lithium. The features of frank poisoning with oral dosage forms of lithium are well known, but the toxicology of chronic low-level exposure needs to be explored now that lithium itself, and some of its alloys, are becoming increasingly important in battery technology and metallurgy.

Heavy metal triad

The triad of heavy metals — cadmium, lead and mercury — are commonly considered together, even though there are substantial differences between them in terms of metabolism and human toxicology. They attracted a lot of interest at the 1977 and 1983 COMTOX meetings, because of issues raised both by environmental pollution and by occupational exposures. Hopefully, acute or chronic occupational poisoning with these metals can be avoided nowadays by good hygiene in the work-place and sound preventative medicine.

In terms of heavy metals, the chief focus of attention at Kitakyushu, 1986, was on the legacies of environmental pollution with cadmium and mercury, especially in the coastal areas of Japan. Much work continues to be done on the various cadmium-binding proteins, and their relevance to the renal dysfunction which dominates cadmium toxicology, and on the biotransformation reactions of inorganic and organic forms of mercury.

". . . a high level of interest has been sustained in the toxicology of metallic chromium and nickel and their compounds."

Amongst the transition elements, the present proceedings only touch upon the toxicology of titanium and manganese, but a high level of interest has been sustained in the toxicology of metallic chromium and nickel and their compounds. Two factors are at work here — their strategic importance as raw materials for many industries, and their carcinogenic potentials. There is no question about the former, but these are real enigmas about the latter topic, which can only be resolved by further painstaking experimental and epidemiological studies.

Another economically important metal with somewhat unusual toxicological features is tin. The genotoxicity of some tin compounds was reported in the 1983 proceedings: it is surprising that there has not been more extensive recent discussion of inorganic and organic tin compounds, because in some countries they (or their breakdown products) are known to be significant contaminants of fresh and marine waters.

At the two previous COMTOX meetings, the noble elements platinum and gold were considered mainly from the analytical point of view. At Kitakyushu, the emphasis was on their pharmacology and nephrotoxicity. This evident complexity of the interactions of soluble platinum and gold compounds with biological systems is remarkable, bearing in mind the chemical unreactivities of the metals themselves.

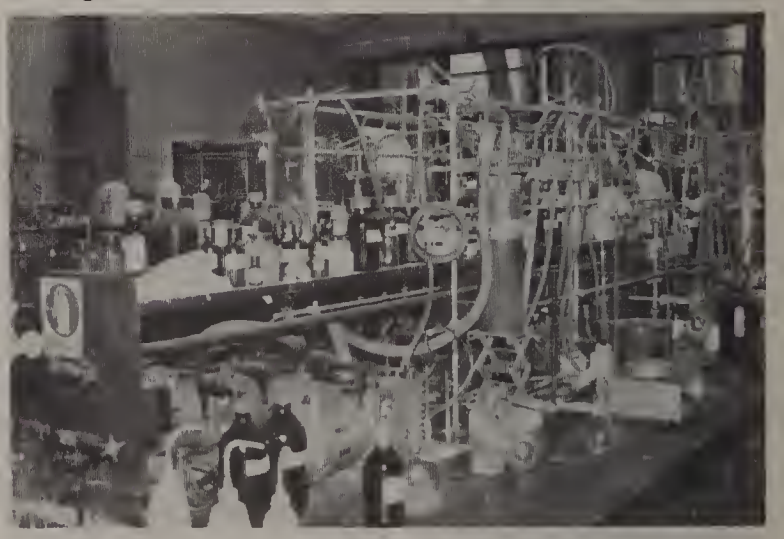
Toxicology of metals: clinical and experimental research *is edited by Stanley S. Brown and Yasushi Kodama and published by Ellis Horwood Limited, Chichester, UK, 1987. viii + 448 pp. ISBN 0 7458 0016 5. Price GBP 50.00/USD 79.95.*

Organic synthesis

Moscow has been closely connected with the development of chemistry in Russia. The first university in the country was founded in the city in 1755 by the efforts of the legendary Russian scholar and scientist, Mikhail Lomonosov, who, along with his numerous achievements in various branches of knowledge, made fundamental contributions to chemistry. Later on, Markovnikov, Zelinsky, Chichibabin, Demyanov, Kizhner, Nametkin, Chugaev, Nazarov and many other prominent chemists lived and worked in Moscow.

It was appropriate then, that the 6th International Conference on Organic Synthesis was held in the Central Building of Moscow University. The 10 plenary, 20 invited lectures and nearly 700 posters presented at the conference covered four main topics:

- Modern methodology in organic synthesis
- Regioselective and stereoselective reactions in organic synthesis
- Elementorganic reagents in organic synthesis
- Homolytic and one-electron transfer reactions in organic synthesis.



The Moscow International Conference on Organic Synthesis included papers on the synthesis of polycyclic hydrocarbons, [5.5.5.5] fenestranes, gibberellins, macrolide antibiotics, alkaloids, lipoxins, streptamine, methylenemalonaldehydes, prostanoids, peptides, cardenolides and bicyclic and polycyclic nitrogen-containing heterocycles.

These topics were selected by the organizing committee as the most representative 'growth points' in the huge and rapidly expanding area of organic synthesis. The lectures delivered at the conference attracted significant interest from 1150 participants representing 31 countries.

One-electron oxidation

One of the papers presented at the conference was on "Reactions of one-electron oxidation in organic synthesis" by Gennady Nikishin (N. D. Zelinsky Institute of Organic Chemistry, Moscow). Nikishin pointed out that studies on free-radical chemistry and its applications to organic synthesis have been carried out at the institute for over two decades.

Homolytic aromatic substitution neglected

"It is difficult to find a modern general organic chemistry textbook in which homolytic aromatic substitution is even mentioned whereas electrophilic and nucleophilic aromatic substitutions feature prominently — even in elementary organic chemistry books. Is homolytic substitution too minor an aspect of aromatic substitution to find right of citizenship in such books? This may have been the case until 15 years ago. Nowadays the neglect of free-radical aromatic substitution is no longer justified at any level: the main reason is the high selectivity determined by polar effects."

From "Selective syntheses by free-radical reactions" by Francesco Minisci and Elena Vismara (Dipartimento di Chimica del Politechnico, Milan, Italy) published in *Organic Synthesis: Modern Trends*.

Evolution in the chemistry of homolytic processes connected with the change from the traditional peroxide initiators to redox systems have been explicitly reflected in these studies. A thorough study of a series of regioselective transformations of functionally substituted alkyl radicals in the redox systems has determined the transition to the next step. In recent years extensive investigations have been carried out by Nikishin and colleagues concerning the conversion of element-centred radicals and cation radicals with an odd electron on oxygen or nitrogen in order to develop new synthetic methods on the basis of these reactions.

Prof. Gennady Nikishin who lectured on reactions of one-electron oxidation in organic synthesis.

Their principal achievement has been the development of a general approach for the one-step remote functionalization of various types of organic compounds at the non-activated carbon. One of the basic principles of classical organic chemistry is that a functional group activates an adjacent α–C atom thus greatly facilitating the reactions at this position. There are numerous methods for the functionalization at this atom (α–functionalization). In contrast, the remote functionalization, that is the regioselective introduction of new functionalities at the non-activated carbon atoms, still remains a highly important and practically unsolved methodological problem of organic synthesis.

The key step in Nikishin's approach is a rearrangement of intermediate oxygen- and nitrogen-centred cation radicals and radicals through the 1,5–H or 1,6–H shift into the carbon-centred radicals, oxidation of which affords functionalization of the starting molecule. In the framework of this approach new non-trivial methods have been developed for the synthesis of diketones, cyanoketones, lactones, pyrrolidines and so on, starting from simple and readily available compounds such as ketones, aldehydes, amines, carboxylic and sulphonic acids and their derivatives.

Polyprenol synthesis

In another paper, Alexander Moiseenkov, also from the N. D. Zelinsky Institute of Organic Chemistry, described how two stereospecific routes to polyprenols have been developed. Polyprenols are an important group of naturally occurring bioregulators.

The linear or "stepwise" route is based on a two-stage *cis*–C_5–homologation of regular prenyl halides with the aid of isoprene *cis*–1,4–bifunctional sulfonyl compounds. The other route is the

N. D. Zelinsky Institute of Organic Chemistry, USSR Academy of Sciences.

"blockwise" approach. In this, thermodynamic stability of E *vic*-disubstituted acroleins is exploited thus securing the construction of an additional Z isoprenoid unit after reductive transformation of the product resulting from controlled cross-coupling of the proper terpenoid aldehyde synthons.

The full papers referred to above together with other plenary and invited lectures presented at the 6th International Conference on Organic Synthesis have been published in *Organic synthesis: modern trends*. The volume includes papers on regenerative carbonyl reactions; metallocomplex catalysis in the synthesis of polycyclic hydrocarbons; novel organic polycycles — an adventure in molecular architecture; planarization of tetracoordinate carbon; synthesis and structure of (5.5.5.5) fenestranes; photochemical reactions as a tool in natural product synthesis — application in Gibberellin field; studies directed towards the total synthesis of Fredericamycin-A; some recent progress in total synthesis of macrolide antibiotics; synthesis and chemical modification of steroid skeletons; and synthetic studies in the alkaloid field.

Organic synthesis: modern trends *edited by Oleg Chizhov is published by Blackwell Scientific Publications Ltd, Oxford, UK, 1987. vii + 327 pp. ISBN 0 632 02014 8. Price GBP 35.00/USD 58.50.*

Chemical thermodynamics

Bulletin of chemical thermodynamics 27/84 is the latest annual index, bibliography and review for published and unpublished research in the intersecting areas of thermodynamics and chemistry. It was prepared under the auspices of the Commission on Thermodynamics (I.2).

The bulletin is divided into the following sections:

- General introduction to the bulletin
- Index to the reports and bibliography by (chemical) substance — (thermodynamic) property:
  I. Organic substances
  II. Organic systems (mixtures)
  III. Inorganic substances
  IV. Biochemical and macromolecular systems.
- Reports of completed but unpublished research and index to contributors
- 1983 Bibliography of papers with chemical thermodynamic content

Bulletin of Chemical Thermodynamics *27/1984 is edited by Robert D. Freeman and published by Thermochemistry, Inc., Stillwater, OK, USA, 1987. viii + 440 pp. ISSN: 0149–2268. Price USD 40.00 per annum. Bona fide personal subscription USD 25.00 per annum.*

Free radical polymerization

The kinetics and mechanisms involved in free-radical polymerizations of vinyl monomers have been research topics of interest for more than 40 years, but in the 1960s the intensity of activity in this area yielded to the excitement of ionic and coordination polymerizations. In the last five years or so there has been a resurgence of interest in studying the kinetics, and questioning the details, of the mechanistic schemes used to describe both homopolymerizations and copolymerizations.

The immediate cause of this renewal of interest is probably the computer: as our computational ability grows, it becomes possible to consider more carefully the simpler kinetic schemes, and to test the somewhat more complex ones that have been proposed from time to time. In addition, the acceleration of interest in process control that has come with computing growth creates a need for models of the polymerization processes that takes us into the realm of high conversion where the simpler models cannot be expected to be adequate.

With this incentive, the IUPAC-sponsored International Symposium on Free Radical Polymerization: Kinetics and Mechanisms was held in Santa Margherita Ligure, Italy in May 1987. More than 200 participants from 22 countries attended the symposium.

Historical overview

The symposium began with three talks of general interest. The first was a historical overview by Macromolecular Division Secretary Aubrey Jenkins (UK). Manfred Stickler (FRG), member of the IUPAC Working Party on Modelling of Polymerization Kinetics and Processes then gave a lecture on "Experimental Techniques in Free Radical Polymerization Kinetics". This was followed by a lecture on "Free radical polymerization: an international study" by Prof. G. C. Eastmond (UK), who is a national representative on the Macromolecular Division Committee. Eastmond outlined the lessons learnt by a IUPAC working party which tried to apply "classical kinetics" to carefully measured data on methyl methacrylate polymerization.

Polymer textbook kinetic and mechanistic models must be regarded as a sort of "zeroth approximation".

In the next four sessions the symposium focused on details of homopolymerization: initiation and inhibition, termination, propagation and radical reactivity, and chain transfer and molecular mass distribution. Two sessions on copolymerization

composition and rate followed, and then one each on non-homogeneous polymerizations and polymerization reaction engineering. The symposium thus progressed from consideration of molecular details of the reaction to applications of those details in complex, multicomponent and heterogeneous systems.

What emerged from these lectures, nearly all of which are printed in Volume 10/11 of *Makromol. Chem., Macromol. Symp.* (1987), was a sense that the kinetic and mechanistic models presented in most polymer textbooks are of great value for understanding the broad outlines of free radical polymerization, but must be regarded as a sort of "zeroth approximation" if one wants qualitatively and quantitatively exact descriptions of the reactions, especially under conditions where conversion of monomer to polymer is high or where more than one monomer is involved.

Macromolecular Merseberg

The 31st IUPAC Macromolecular Symposium was held from 31 June to 4 July 1987 at the "Carl Schorlemmer" Technical University in Merseberg, German Democratic Republic, and was attended by about 1000 participants from 32 countries. During the conference 275 lectures and 610 posters were presented in 8 microsymposia.

The topics of these microsymposia were:

1. Synthesis of polymers
2. Modification of polymers
3. Natural polymers
4. Structure and properties of polymers
5. Phase equilibria
6. Materials and technology
7. Special use of polymers
8. Biomedical application of polymers

Professor Manfred Fedtke ("Carl Schorlemmer" Technical University) who lectured at Merseberg on "Reactive oligomers and polymers: synthesis and application for polymer modification".

Each of the microsymposia were introduced by one or two plenary lectures. Volume 12 of *Makromol. Chem., Macromol. Symp.* (1987) contains the texts of these plenary lectures. The following general trends in macromolecular science today can be deduced from these plenary lectures and from the other contributions to the symposium.

Polymer synthesis is no longer only satisfied with the presentation of new polymer compounds and polymer morphologies. Increasing knowledge of the mechanism of formation of polymer structures and of the structure–property relation is used in the generation of new polymers with the desired properties. The demand for special tailormade polymers, especially in the field of advanced technologies such as microelectronics greatly stimulated the close cooperation between polymer science and engineering science. The methodological gap between natural and synthetic polymers is being rapidly closed in the experimental and theoretical fields. This development was pro-

Merseberg, venue of the 31st IUPAC Macromolecular Symposium.

moted by the need to understand and influence interactions between polymers and living systems and also by a growing interest in using renewable resources.

Diseases of suspected chemical etiology

The *Environmental Health Criteria Series* includes a number of publications dealing with the methodology of data interpretation and risk assessment (see pp. 42–43, *CI*, March 1988). Number 72 in the series is one of these. It is entitled *Principles of studies on diseases of suspected chemical etiology and their prevention.*

This volume gives investigators confronting a disease of unknown causality a logical, step-by-step strategy for tracing the possibility that a man-made or natural chemical is the cause. The strategy, which is divided into five progressive steps, is based on experiences indicating the value of a disease-oriented approach that differs, in several important ways, from classical methods used in predictive toxicology. Throughout the book, emphasis is placed on the character and sequence of questions that will be of greatest help in determining whether a chemical is implicated and then identifying the chemical.

The need to recognize and describe the disease is presented as the starting point of the investigation. Readers are guided in ways to recognize index cases, screen populations, define and identify cases, and collect pathological clues pointing to a chemical etiology. The second section, which concentrates on the search for determinants, shows how epidemiological studies can be used as analytical tools for the generation of valid etiological hypotheses. The third section outlines toxicological studies necessary to test the hypothetical involvement of suspected chemicals. Problems, including bias, in establishing the causal relationship between one or several suspected agents and the observed disease patterns are also considered. Further sections outline steps that should be taken once a chemical etiology has been confirmed and discuss the importance of international cooperation. Readers are also given a checklist, presented in an appendix, illustrating sequential steps that have been used in a number of successful investigations of unusual diseases that proved to have a chemical etiology. A second appendix provides a summary report of current research on the etiology of Kashin-Beck disease, a widespread endemic disease where exposure to certain environmental chemicals is considered an important etiological factor.

The book will serve as a practical and expert guide for any investigator who suspects that a chemical may be involved in the etiology of an episodic or endemic disease.

Environmental Health Criteria No. 72: Principles of studies on diseases of suspected chemical etiology and their prevention *is published in English by the World Health Organization, Geneva, 1987, 79 pp. ISBN 92 4 154272 1. Price CHF 9.00/USD 5.40. A French edition is in preparation.*

FAO publications on pesticides and food

Pesticide residues in food

The FAO (Food and Agriculture Organization of the United Nations) have published two papers on pesticide residues in food. FAO plant production and protection papers 84 (*Report 1987*: ISBN 92 5 102620 3) and 86/1 (*Evaluations 1987: Part I — Residues*: ISBN 92 5 102648 3) are reports of a joint meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the World Health Organization Group on Pesticide Residues held in Geneva 21–30 September 1987.

Codex Alimentarius

Codex Alimentarius Volume XIII *Codex maximum limits for pesticide residues* (2nd edn) contains all Codex maximum residue limits adopted by the Codex Alimentarius Commission up to and including the 16th Session (August 1986). It is issued by the Secretariat of the Joint FAO/WHO Food Standards Programme, FAO, Rome.

World Food Report 1987

Each year the *World Food Report* provides an up-to-date briefing on the world food and agriculture situation and reviews the work of the Food and Agriculture Organization (FAO) of the United Nations during the previous year. It also includes general background information on current topics of interest in food and agricultural development. The report is based on data available as of 31 March in the year of publication.

The report is intended primarily for use by the media, non-governmental organizations and all individuals responsible for mobilizing support for agricultural and rural development. It is not a technical document. Readers requiring detailed technical data should refer to publications such as the *State of Food and Agriculture* and the various statistical periodicals and yearbooks issued by FAO.

For information on FAO publications and sales agents, please write to Distribution and Sales Section, FAO, Via delle Terme di Caracalla, 00100 Rome, Italy.

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Chemistry of a good brew

The production of ethanol by microorganisms as a result of the fermentation of sugars and starch is a process that precedes recorded history. Although by far the largest volume of ethanol produced via fermentation is employed for potable purposes, an increasing volume of fermentation ethanol is being produced for fuel ethanol energy either on its own or more usually admixed with gasoline. The production of fermentation ethanol for fuel energy is currently of interest in the United States, Brazil, Argentina, and a number of other countries.

The manufacture of beer is a biological process whereby agricultural products, such as barley and hops, are converted into beer by control of the biochemical reactions in malting, mashing and fermentation. The first two processes together produce a medium known as wort; to this yeast is added, and fermentation is allowed to proceed. Wort is essentially an aqueous extract of malted barley, the primary raw material in the manufacture of beer. Yeast cells are added to the wort and the cells take up nutrients and utilize them so as to increase the yeast population. In doing this, the cells excrete major end-products such as ethanol and carbon dioxide into the medium, together with a host of minor metabolites, many of which contribute to the overall flavour of the final beer.

A brewer checks fermentation. Brewery fermentations are slow, non-agitated and at below ambient temperatures; quicker fermentations at higher temperatures or under agitated conditions tend to produce severe off-flavours in the beer. (*Photo courtesy Watney Mann & Truman Brewers Ltd.*)

Until recently, the brewing industry has traditionally been conservative when dealing with yeast performance optimization. Rather than dwelling exclusively on a single fermentation product yield (e.g. ethanol), the brewer has quite rightly placed greater emphasis on the flavour characteristics of the final product. Brewery fermentations are slow, non-agitated and at below ambient temperatures; quicker fermentations at higher temperatures or under agitated conditions tend to produce severe off-flavours (due to a plethora of compounds including fusel oils, esters and sulphur compounds) in the beer. However, in the production of fermentation industrial ethanol, the formation of a potable product is not an issue and, as a consequence, the fermentations are usually conducted at, or above, ambient temperatures and are invariably agitated.

There are a number of microorganisms (yeast and bacteria) that produce significant (greater than 1% w/v) quantities of ethanol. However, at the present time, in excess of 95% of the fermentation ethanol produced globally involves the use of *Saccharomyces cerevisiae* and its related species. No other group of microorganisms has been more intimately associated with the progress and well-being of the human race than the yeasts. Their contribution to man's progress has been based, very largely, on the capacity of certain yeasts to rapidly and efficiently convert sugars to ethanol and carbon dioxide via the alcoholic fermentation of sugary liquids such as grain extracts, grape juice and milk. In addition, there are a number of recently developed industrial uses for yeast including cultures that have been genetically transformed to produce important non-yeast proteins and peptides, such as, the antiviral protein interferon, human serum albumin, and the acid protease chymosin employed in the milk-clotting step in cheese production.

The above discussion is the introduction of a paper by Graham Stewart and Inge Russell (Labatt Brewing Company Ltd, Ontario, Canada) entitled "Biochemistry and genetics of carbohydrate utilization by industrial yeast strains". The paper was presented as a plenary lecture at the 13th Interna-

tional Carbohydrate Symposium, Ithaca, New York, USA, 10–15 August 1986. The plenary lectures from the symposium were published in the November 1987 issue of *PAC* (Vol. 59, No. 11).

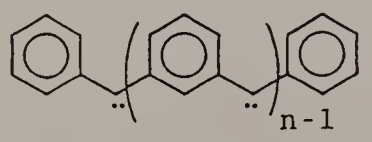
Aligning electron spins

The large majority of organic molecules have closed-shell electronic structures, that is, they have singlet ground states with equal numbers of electrons with α and β spins. Most organic compounds are therefore diagmagnetic.

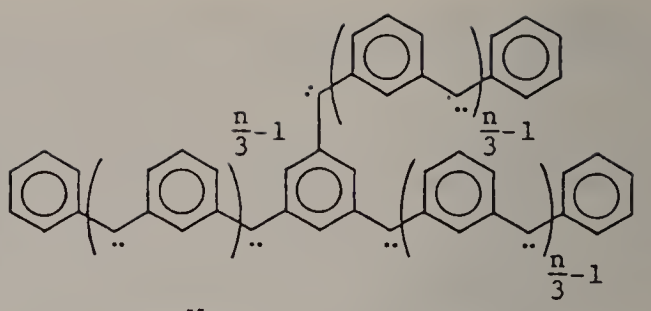
However, there are some organic molecules that have open-shell structures where not all electrons are paired. Many of these molecules have one odd electron and therefore a doublet ground state. These free radicals are paramagnetic.

The alignment of spins in molecular systems becomes an issue when there is an interaction between two doublet centres as in diradicals and radical pairs. The Coulombic repulsion between electrons lifts the zeroth-order degeneracy and gives rise to singlet and triplet states of different total energy.

Recently, Hiizu Iwamura and his colleagues at the Institute for Molecular Science, Okazaki, Japan, have shown that polycarbenes **I** and **II** generated by photolysis of the corresponding polydiazo compounds have their highest possible spin multiplicities in their ground states.



I (n = 3,4,5,6)



II (n = 3,6)

Magnetic susceptibility measurements have revealed that nonet tetracarbene **I** ($n = 4$) is paramagnetic with a very large magnetic moment. Higher homologs of **I** and **II** are expected to be best characterized as organic supermagnets.

Curie plots of the paramagnetic susceptibility of **I** ($n = 4$) in 2-methyltetrahydrofuran glass or in polycrystalline samples have shown, however, that the intermolecular interaction in the fortuitously formed aggregates under these conditions is antiferromagnetic. It appears to be the rule rather than the exception that the intermolecular interaction between open-shell organic molecules should be antiferromagnetic.

To obtain spin alignment on a macroscopic scale through the molecular assembly it is therefore imperative to design ferromagnetic molecular interactions. There appear to be a couple of plausible methods for achieving this objective. One is to take advantage of a weak hyperconjugative interaction through a short-chain connecting high-spin molecule. The other is the design of molecular stacking of spin-distributed aromatic rings leading to intermolecular spin alignment.

Iwamura discussed the latter strategy based on McConnell's in the plenary lecture presented at the 8th International Conference on Physical Organic Chemistry held in Tokyo, Japan, 24–29 August 1986. The plenary lectures from the conference are published in the December 1987 issue of *PAC* (Vol. 59, No. 12).

Tokyo: venue of 8th International Conference on Physical Organic Chemistry.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Critical evaluation of calibration procedures for distribution analysis of dopant elements in silicon and gallium arsenides

Strategies for highly accurate quantitative distribution analysis of the most important dopant elements in silicon (B, As) and gallium arsenide (Si) by combination of various methods with different systematic errors are discussed. Analytical figures of merit are given for the methods applicable to a specific problem evaluating Secondary Ion Mass Spectrometry (SIMS), Rutherford Backscattering Spectrometry (RBS), Neutron Activation Analysis (NAA), Charged Particle Activation Analysis (CPAA), electrical and magnetic measurements.

This report was prepared for publication by M. Grassebauer, Working Group on Surface Analysis, Commission on Microchemical Techniques and Trace Analysis (V.2), Analytical Chemistry Division and published in PAC, *Vol. 60, No. 3, pp. 437–444, 1988.*

New notations in the periodic table

In 1985 the IUPAC Commission on the Nomenclature of Inorganic Chemistry circulated for public comment a proposed new notation for the groups of the periodic table. This gave rise to world-wide discussion in the chemical literature. This article reviews the historical process that led to the IUPAC proposals, and discusses them in relation to the response within the scientific community.

This report was prepared for publication by E. Fluck, Inorganic Chemistry Division and published in PAC, *Vol. 60, No. 3, pp. 431–436, 1988.*

Newsletters & Bulletins

IUPAC Committee on the Teaching of Chemistry (CTC)

International Newsletter on Chemical Education, No. 27, June 1987. Most of the articles in this issue describe new trends in, or innovative approaches to, the teaching of chemistry at the secondary level around the world. A common theme to emerge is the move towards 'science for all', and some of the attempts to meet the challenge of making chemistry, or at least the chemistry components of integrated science curricula, much more relevant and appealing to the majority of students are highlighted.

Brendan Schollum of New Zealand, Geisha Rebolledo of Venezuela, and Kevin de Berg of Australia describe some of the changes taking place in their countries, and ways in which the challenges are being met there.

John Holman, Director of the Science and Technology in Society project, outlines the response to the challenge by the Association for Science Education in the UK, while Herb Thier describes a similar approach in the USA through the Chemical Education for Public Understanding Project, which he directs. Emil Lisk briefly describes how African countries may meet the challenge and make science more relevant to the needs of the majority of students throughout the continent.

The IUPAC Commission on Teaching of Clinical Chemistry makes a plea for some inclusion of clinical chemistry in secondary school chemistry courses: and P. Petrovic and his Czech colleagues give an account of a seminar on the International Chemical Olympiad.

Bruce Lewenstein's account of the work of the Center for the History of Chemistry, and the report by L. Paolini, while not relating specifically to the theme of secondary school chemistry, none the less raise issues important to it.

International Council of Scientific Unions (ICSU)

Science International, No. 31, December 1987. This issue features reports on genetically modified organisms and the environment (see p. 125 of this issue of *CI*) and the global impact of pollution on health. There is also a report on the Third World Academy of Sciences Second General Conference on "The Future of Science in China and the Third World" in Beijing in September 1987.

ICSU Commission on the Application of Science to Agriculture, Forestry and Aquaculture (CASAFA)

CASAFA Newsletter, July 1987. The two major topics in this issue are a symposium on sustainable agriculture held at the International Rice Research Institute in May 1987 and the World Commission on Environment and Development.

ICSU Committee on Space Research (COSPAR)

COSPAR Information Bulletin, No. 110, December 1987 contains news of past and future meetings including the "Antarctic ozone now decreasing symposium" held in Japan in December 1986.

ICSU Committee on the Teaching of Science (CTS)

International Newsletter on Science Technician Training, No. 7, December 1987 has reports on the 1st International Symposium on Technician Education and Training held in Ireland in August 1986; formal education and training of science technicians in Nigeria; and an open learning programme for science laboratory technicians.

ICSU Scientific Committee on Antarctic Research (SCAR)

SCAR Bulletin, No. 87, September 1987 is devoted to a report of the SCAR Executive Meeting held in France in July 1987.

BIOMASS Newsletter, Vol. 9, No. 1, July 1987. BIOMASS is the acronym for Biological Investigations of Marine Antarctic Systems and Stocks. This is a major international programme of the Antarctic marine ecosystem and its living resources. The programme is sponsored by various ICSU Scientific Committees including SCAR. This issue of the newsletter has a report on a scientific seminar on antarctic ocean variability and its influence on marine living resources, particularly krill, held at UNESCO headquarters in Paris in June 1987.

ICSU Committee on Data for Science and Technology (CODATA)

CODATA Bulletin, No. 65, October 1987 is a report of the CODATA Task Group on the Coordination of Protein Sequence Data Banks. The report is entitled: "Directory of protein and nucleic acid sequence data sources".

CODATA Newsletter, No. 43, January 1988 contains brief reports and notes on topics such as: alloy phase diagrams, geothermodynamics and a global database.

Association of Official Analytical Chemists (AOAC)

The Referee, Vol. 11, No. 7, February 1988 includes details of a new AOAC short course on field and laboratory sampling of food, drugs, and agricultural commodities. This will be presented for the first time from 30 November to 1 December 1988 in Arlington, VA, USA.

European Federation of Biotechnology (EFB)

EFB Newsletter, No. 8, September 1987. In June 1987, the largest biotechnology event in the world — the 4th European Congress on Biotechnology — took place in Amsterdam. More than 2000 participants attended. This newsletter contains a report of the congress as well as reports on EFB scientific activities and the EFB general assembly also held in Amsterdam in June 1987.

European Photochemistry Association (EPA)

EPA Newsletter, No. 31, November 1987 consists of 72 pages including articles on how to improve H_2O_2 photolysis as an OH-source in simulated atmospheric degradation testing of chemicals; actinometry with tris(2,2'-bipyridyl) ruthenium (II)/peroxodisulphate in aqueous solution; effect of light scattering on quantum efficiencies; solar energy and photochemistry group in Rajasthan, India; and much more.

Groupement pour l'Avancement des Méthodes Spectroscopiques et Physico-Chimiques d'Analyse (GAMS)

GAMS — Information Bulletin No 104, November–December 1987 contains news — in French — of various GAMS activities and publications.

International Association for Cereal Science and Technology (ICC)

ICC Newsletter, No. 9, October 1987 provides news of various ICC activities including forthcoming meetings on cereals — basic food for everybody; the processing of sorghum and millets; and wheat and flour characterization for specific end uses.

International Federation of Clinical Chemistry (IFCC)

IFCC News, No. 49, 1988/1 features clinical chemistry in developing countries and includes articles on clinical chemistry in Latin America — Colombia — and the role of the laboratory scientist in Latin America. There is also a WHO item on quality assurance in nuclear medicine and a recommendation on optical spectroscopy by N. Sheppard, H. A. Willis and J. C. Rigg: "Review of recommendation (1986) on names, symbols, definitions and units of quantities in optical spectroscopy" (see *PAC*, Vol. 57, No. 1, pp. 105–120, 1985).

International Organization for Standardization (ISO)

ISO Bulletin, No. 3, March 1988 focuses on ergonomics — design for humans. The bulletin contains a brief report on *TC 47: Chemistry* concerning aluminium chemistry: aluminium oxide, cryolite, aluminium fluoride, sodium fluoride and carbonaceous products for the aluminium industry.

International Union of Food Science and Technology (IUFoST)

IUFoST Newsletter, No. 17, December 1987 is devoted to IUFoST business and includes a message from the president, a report on the 7th World Congress of Food Science and Technology and the 5th IUFoST General Assembly — both of which were held in Singapore, September 1987.

International Union of Radio Science (URSI)

URSI President, Prof. Alex Cullen on a visit to the IUPAC Secretariat in February 1988.

URSI Information Bulletin, No. 243, December 1987. URSI is the abbreviation for Union Radio-Scientifique Internationale based in Brussels, Belgium. The bulletin contains reports on URSI activities in either French or English. It contains an item on the International Workshop on Ionospheric Informatics held in Novgorod, USSR in May 1987 and also details of the solar–terrestrial energy programme 1990–1995.

Food and Agricultural Organization of the United Nations (FAO)

Ideas & action, No. 175, 1987/4 places emphasis on "how to help people organize for production". The first article describes the experience of an organization in Chile which promotes agricultural activities based on local resources while at the same time helping develop the leadership and organizational capacities of the peasant and poor urban communities with whom they have been working since 1981. The second article is a report of a workshop in Botswana on production organization and the final item is concerned with networking among the rural women in the Pacific.

United Nations Educational, Scientific and Cultural Organization (UNESCO)

Protection by copyright

'The protection of the moral and material interests of authors in relation to their works is a principle recognized by the Universal Declaration of Human Rights of 10 December 1948, which stipulates: "Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits. Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author."'

The above paragraph is an excerpt from an article on the protection of copyright in *UNESCO News*, No. 219, December 1987.

Newsletter of the Regional Network for the Chemistry of Natural Products in Southeast Asia, Vol. 11 No. 2, May–August 1987. The Southeast Asian Network for the Chemistry of Natural Products started operations in 1977 as a result of an initiative by Unesco in 1974. The network is a regional grouping of 10 countries with representatives for each of the national points of contact in the countries concerned. Its main objective is to promote natural products chemistry, primarily in

order to advance economic and educational goals within the less developed areas of the region. To this end, it aims to make the most efficient use of experience and resources within the regional grouping and to contribute to and benefit from global expertise in the chemistry of natural products. The newsletter contains reports of various network activities and meetings.

SCAMAP Newsletter, December 1986. SCAMAP is the South and Central Asian Medicinal and Aromatic Plants Network. This issue of the newsletter includes reports on medicinal and aromatic plants from the following countries: Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka and Turkey.

International Programme on Chemical Safety (IPCS)

Sentinel: Health & Environment International, Vol. 5, No. 1, January 1988. The headline of this issue reads 'Protecting man and his environment from the hazards of chemicals'. It refers to a report of a five-day workshop held in Nairobi in September 1987 to discuss chemical hazards in African countries. There is also a feature article entitled 'The ozone depletion problem — Montreal protocol is a major triumph for UNEP'. UNEP is the United Nations Environment Programme.

Environment Liaison Centre (ELC)

Ecoforum, Vol. 12, Nos 3 & 4, 1987 has a report on the World Commission on Environment and Development entitled 'Our common future' and details of grants (up to USD 300) offered by the Nitrogen Fixing Trees Association (NFTA, PO Box 680, Waimanalo, Hawaii 96796, USA). The grants are to assist individuals and organizations working in development to promote the use of nitrogen fixing trees.

Nitrogen Fixing Trees Association offers grants.

Conferences

Thermal analysis and calorimetry
Jerusalem, Israel, 21–25 August 1988

IUPAC SPONSORED

The 9th International Congress on Thermal Analysis and Calorimetry (9th ICTA) will be held at the Hyatt Regency Hotel, near the campus of the Hebrew University on Mount Scopus.

The congress aims to bring together those involved in research and applications of thermal analysis and calorimetry techniques. The congress scientific programme will include plenary and introductory sectional lectures, workshops, symposia, contribution papers and an exhibition.

The Hyatt Regency Hotel, Jerusalem, venue of 9th ICTA.

Specific topics of the congress are: theory, applications, instrumentation, education, solid-state chemistry, pyrolysis, heterogeneous catalysis, high-temperature superconducting materials, polymers, thermophysics, thermally stimulated processes (TL, TSC, TSD etc), geochemistry, mineralogy, clay science, zeolites, mining engineering, agriculture, pedology, biology, medical sciences, pharmaceuticals, metallurgy, ceramics, plastics, oil and petroleum, glass, cement, coal, oils and fats, archaeological ceramics, mechanochemistry, food sciences, membranes and combustion.

The congress will be conducted in English. Registration fees are USD 215 and USD 240 for ICTA members and non-members respectively. The fee for students is USD 85.

The fee entitles the registrant to participate both at the scientific session and the social programme (except the Farewell Banquet), participation in scientific sessions, book of abstracts including programme, two volumes of proceedings, coffee during breaks, welcome reception, opening ceremony, reception and visit to the Israel Museum and a guided tour. Accommodation is available in local hotels at rates of USD 18 to USD 36 per person per night in a double room or USD 31 to USD 61 per person per night in a single room.

Jerusalem, the capital of Israel, is holy to all monotheistic religions and is a centre for pilgrimage. A guided tour of the holy places in and around the Old City is planned for the afternoon of Wednesday 24 August. The Hyatt Regency Hotel is located on the slopes of Mount Scopus from which there are sweeping views of the Old City.

Physical organic chemistry

IUPAC SPONSORED

Regensburg, FRG, 21–26 August 1988

The 9th IUPAC Conference on Physical Organic Chemistry will be held at the University of Regensburg. The symposium will be concerned with all aspects of physical organic chemistry and will emphasize methods applied in physical organic chemistry.

The scientific programme will consist of contributed oral papers, posters, and the following plenary lectures:

- Reactivity patterns of transient radicals in solution by time resolved ESR (H. Fischer, Zürich, Switzerland)
- Radical thermochemistry and organic reactions (D. Griller, Ottawa, Canada)
- Variations of molecular geometry from electron diffraction (I. Hargittai, Budapest, Hungary)
- *Ab initio* and empirical computations of mechanism and stereoselectivity (K. N. Houk, Los Angeles, USA)
- Kinetics and reaction mechanism; selected examples from the experience of forty years (R. Huisgen, Munich, FRG)
- Stereochemical studies on crystal nucleation (M. Lahav, Rehovot, Israel)
- Physical organic aspects of supramolecular chemistry (J. M. Lehn, Strasbourg, France)
- Design of low-energy barrier intramolecular rearrangements by fitting stereoelectronic requirements of reaction paths (V. J. Minkin, Rostov, USSR)
- Applications of dynamic NMR spectroscopy to the dissociation of chemical bonds in organic, organometallic and coordination compounds (M. Oki, Tokyo, Japan)
- Electron and charge demands of stabilizing groups in carbanions and nitranions: the NMR approach (A. Pagani, Milan, Italy)
- Picosecond dynamics of organic ion pairs (K. Peters, Boulder, USA)
- Interstellar organic chemistry (C. De Puy, Boulder, USA)
- Theory and experiment in concert on the generation of elusive neutrals and dications by neutralization and charge stripping of gaseous monocations (H. Schwarz, Berlin, FRG)
- Resonance interactions in acyclic systems (K. B. Wiberg, Yale, USA)

The registration fees are DEM 420 for participants, DEM 378 for IUPAC affiliates and GDCh members, DEM 80 for students and DEM 90 for accompanying persons.

The conference is at the end of the summer season. Temperatures around 20–25°C are to be expected. Although the organizing committee has ordered sunny and dry weather, it would be wise to come prepared for cooler and rainy days. There is no air-conditioning in the buildings used for the conference or the hotels, as this is seldom needed.

Solubility phenomena

IUPAC SPONSORED

Surrey, UK, 23–26 August 1988

The 3rd International Symposium on Solubility Phenomena will be held at the University of Surrey, Guildford. The symposium will be concerned with many aspects of solubility and consist of contributed papers, posters and computer displays and the following plenary lectures:

- Solubility of pharmaceuticals (A. Beezer, UK)
- Macrocyclic ligands and electrolyte solubility (B. G. Cox, UK and H. Schneider, FRG)
- Thermodynamics of solutions (D. Feakins, Ireland)
- Polymer–solvent systems (R. Koningsveld, Netherlands)
- Gas–liquid equilibria (B. Streett, USA)
- Microcalorimetry and solubility studies (I. Wadsö, Sweden)
- Solubility of pollutants (J. D. Wilkins, UK)

The official language of the conference will be English, but scientific communications may be

Solubility phenomenon at the University of Surrey.

given in English or French. Simultaneous translation will not be provided.

The standard registration fee for scientific participants is GBP 100.00, for students GBP 30.00 and accompanying persons GBP 30.00. A 10% reduction will be given to IUPAC affiliates.

University accommodation is highly recommended. Single rooms, including breakfast, are available at a relatively low cost. Nearby hotel accommodation will be available at much higher cost.

A number of visits to places of interest have been planned for those not engaged in the scientific activities of the symposium. There will also be a musical evening for all to attend.

Guildford is about 50 km south-west of London. The town is well served by local, national and international transport facilities.

Coordination chemistry
Porto, Portugal, 29 August–2 September 1988

IUPAC SPONSORED

The 26th International Conference on Coordination Chemistry will be held at the Faculty of Economics, University of Porto, Portugal. The official language of the conference will be English.

The scientific programme includes five plenary lectures, 26 session lectures, and five microsymposia. All other contributions will be in the form of poster presentations. There will be five topics:

- *Structure, bonding and energetics*
  Plenary lecture: "Intermediates in organometallic photochemistry" (J. J. Turner, Nottingham University, UK)
- *Synthesis and reactivity*
  Plenary lecture: "Structure and reactivity of rhodium(I) complexes" (F. Pruchnik, Wroclaw University, Poland)
- *Bioinorganic chemistry*
  Plenary lecture: "Novel iron–sulphur clusters and spin coupling in clusters with valence delocalization" (E. Munck, Minnesota University, USA)
- *New materials*
  Plenary lecture: "New organometallic solids" (M. L. H. Green, Oxford University, UK)
- *Techniques and applications*
  Plenary lecture: "Developments in functionalization of macrocyclic polyamines" (E. Kimura, Hiroshima University, Japan)

Abstracts of the scientific contributions will be published in the conference proceedings which will be distributed during registration. Plenary and session lectures will be published in *PAC*.

Registration fees are USD 200 for full participants, USD 100 for students and USD 85 for accompanying persons. The fees for participants and students cover admission to all scientific events, conference publications, all complementary social events, refreshments at coffee breaks and transportation. Accommodation is available in local hotels and a students' hall of residence.

The temperature in Porto at the time of the conference is normally between 20 and 30°C. Fog may occur in the mornings. A fresh breeze generally blows by the seaside in the afternoons. Very occasionally there may be rain or a slight drizzle.

Chemical thermodynamics
Prague, Czechoslovakia, 29 August–2 September 1988

IUPAC SPONSORED

The 10th IUPAC Conference on Chemical Thermodynamics is being organized by the Prague Institute of Chemical Technology in cooperation with the Czechoslovak Academy of Sciences and the Czechoslovak Chemical Society. All sessions of the conference will be held on the campus of the University of Agriculture, located in the northwest outskirts of Prague.

The scientific programme will consist of invited

The City of the Hundred Towers hosts the 10th IUPAC Conference on Chemical Thermodynamics: a view of Prague from the Little-Town Bridge Tower.

main lectures, invited short lectures, and posters and the following topics:

- pure substances
- mixtures of non-electrolytes
- phase equilibria
- thermodynamics and thermochemistry of interphases and surface phenomena
- statistical mechanics of fluids and solutions
- polymer systems
- biological systems
- aqueous systems
- calorimetry and other experimental techniques
- data treatment

Lectures will be held in two or three parallel sessions. Each session will be introduced by an invited main lecture. Most of the contributions will be presented as posters.

The official language of the conference is English. Summaries of all contributions will be published in a programme booklet.

The registration fee will be USD 230 for active participants and USD 150 for accompanying persons. All accommodation will be reserved in the student dormitories of the University of Agriculture. Cost of accommodation and full board is included in the registration fee. All participants are invited to take part in the social events, including a sightseeing tour and concert.

Prague lies on the banks of the Vltava river. It is the largest and most important historical urban reservation in Czechoslovakia and has over a million inhabitants. Numerous archaeological finds show that the city has been continuously inhabited for several thousand years. Nineteenth-century Prague was known as the City of the Hundred Towers. Today it has some 500 towers.

Macrocyclic chemistry

IUPAC SPONSORED

Hamburg, FRG, 4–8 September 1988

The 13th International Symposium on Macrocyclic Chemistry will be held at the University of Hamburg. The symposium aims to provide a forum for the presentation and discussion of recent research in the chemistry of macrocyclic compounds. The scientific programme includes the following main topics and plenary lectures:

- *Supramolecular chemistry*
  Perspectives in supramolecular chemistry (J.-M. Lehn, France)
- *Molecular recognition/Enzyme modelling*
  Molecular recognition by synthetic receptors (I. O. Sutherland, UK)
  Model studies in molecular recognition (J. Rebek, USA)

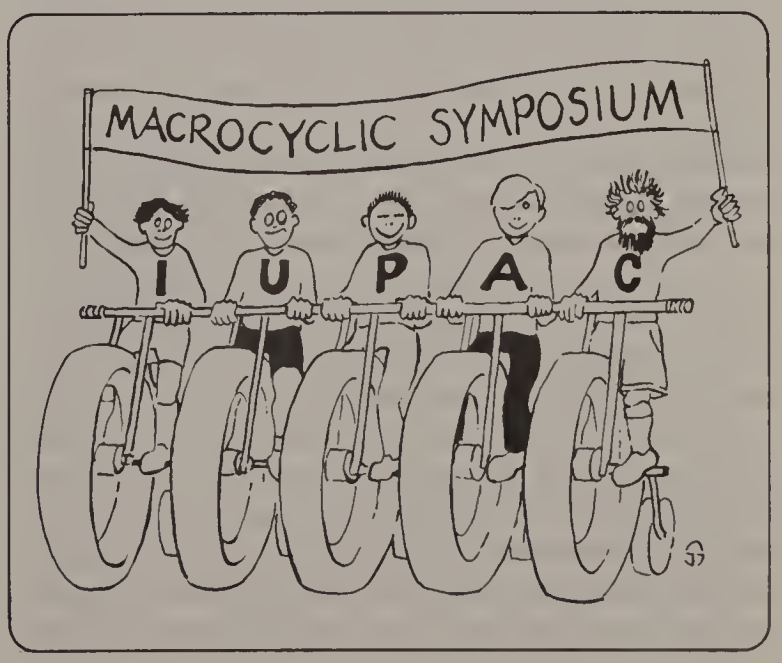
Entrance to conference building and logo for the 13th International Symposium on Macrocylic Chemistry, Hamburg.

- *Kinetics and thermodynamics*
  Molecular dynamics of macrocycle–metal ion complexes involving heteronuclear binding atoms (S. Petrucci, USA)
- *Synthesis and structure/Complexing behaviour*
  Macrocyclic chemistry in reducing environments: from concentrated alkali metal solutions to crystalline electrides (J. Dye, USA)
- *Analytical applications*
  Chromogenic crown ether reagents in analytical and separation chemistry (M. Takagi, Japan)

Further topics are: Transport systems; Synthetic applications; and Phase transfer catalysis.

The whole scientific programme will comprise plenary and session lectures as well as a poster session and short poster discussion. Presentations will be selected for the short poster discussions.

The official language of the symposium will be English. The registration fee is DEM 350. The fee entitles the registrant to participate both at the scientific sessions and the social programme (except conference dinner), a copy of the final pro-



gramme, an abstracts volume and refreshments during the breaks. Accommodation is available in local hotels at rates ranging from DEM 50 to DEM 250 per night.

The city of Hamburg, located in the north of the Federal Republic of Germany, is one of Germany's largest cities and the largest German seaport. It is also a world-renowned centre of trade and commerce. The city is proud of its history shaped by the period of the mediaeval Hanse. Cosmopolitan ever since, Hamburg today is a city with leading trading companies and world-famous firms, a centre of the aerospace industry, a city of research and important university facilities.

Organometallic chemistry

IUPAC SPONSORED

Turin, Italy, 4–9 September 1988

The 13th International Conference on Organometallic Chemistry (XIII ICOMC) will be held at Torino Esposizioni. The conference will cover several aspects of organometallic chemistry including solution, solid state and catalytic properties.

The scientific programme of XIII ICOMC will include main session lectures, communications, posters and the following plenary lectures:

- New reagents for carbon–hydrogen activation: organo-rhodium and -iridium trispyrazolylborates (W. A. G. Graham, Canada)
- Tuning of the reactivity of metals held in a rigid ligand environment (G. van Koten, Netherlands)
- New results in organo-f elements reactivity, thermochemistry and catalysis (T. J. Marks, USA)
- Selectivities in organic reactions via allylpalladium complexes (J. Tsuji, Japan)
- Some reminiscences (G. Wilkinson, UK)

The main session lectures are planned on the following topics: highly strained cyclic alkynes on transition metal centres; electron-rich metal complexes for CO_2 and CS_2; ditungsten centres; ruthenium complexes; bent metallocene complexes; transition metal acyl bonds; main group metallocenes; organosilicon reagents; rhodium-promoted reactions; palladium carbonyl clusters; 2-D NMR; and the ligand sphere of clusters.

The official language of the conference is English. An exhibition by leading organizations will be held during the conference.

The registration fee is ITL 400 000 for active participants, ITL 200 000 for junior scientists and ITL 115 000 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction. The registration fee for active participants and junior scientists includes participation in the scientific programme, coffee-break beverages, one copy of the abstract volume and the welcome cocktail.

Accommodation is available in local hotels. The prices per night for a single room with bath, including breakfast, service and taxes range from ITL 55 000 to ITL 190 000. Accommodation is also available in the university residences for ITL 100 000 per person for 7 nights.

Turin is situated on the river Po in Piedmont, at the foot of the Cottian Alps in North Western Italy. As the ancient fortified city of the Cisalpine Celtic tribes, Turin's urban layout follows that of the Roman legion camps and bears monuments to 18th-century architecture. Today, the city is the home of Italy's major car manufacturers. It also has strong links with chemical research. Avogadro lived in the city and Berthollet studied there. Sobrero and Cannizzaro both taught in the city.

In early September the weather is normally pleasant and dry. The average temperature is 20°C.

Automation and new technology in the clinical laboratory

Kobe, Japan, 5–8 September 1988

IUPAC SPONSORED

The 1st and 2nd International Congresses on Automation and New Technology in the Clinical Laboratory were held in Barcelona, Spain, and organized jointly by the Spanish Society and the International Federation of Clinical Chemistry (IFCC), Expert Panel on Automation. The aim was to bring together from all pathology disciplines, scientists experienced in the use of automation in the laboratory. The congresses proved successful and attracted a broad spectrum of scientists. An industry exhibition was held on both occasions.

The Japanese Society accepted the invitation to organize the 3rd International Congress and decided upon Kobe as the venue. The IFCC Expert Panel on Automation and the Japanese Organizing Committee plan to continue the successful format established in Barcelona. There will be an industry exhibition which will offer participants an opportunity to view the latest developments by Japanese and other manufacturers.

The scientific programme will cover a number of rapidly developing areas and should prove attractive to all laboratory workers. The congress symposia will include:

1. Expert systems
2. Clinical chemistry in whole blood
3. Separation techniques
4. Immunodiagnostics
5. Robotics
6. NMR

7. Gene technology
8. New techniques in coagulation
9. New diagnostic techniques using saliva as an alternative to blood
10. Instrumentation for the small laboratory
11. Luminescence (chemiluminescence; time-resolved fluorescence)
12. Biosensors
13. Flow cytometry
14. New techniques in haematology
15. New techniques in microbiology

Raman spectroscopy

IUPAC SPONSORED

London, UK, 5–9 September 1988

The 11th International Conference on Raman Spectroscopy is being organized by the Royal Society of Chemistry. It will be held at the University of London's Institute of Education.

The scientific programme for the conference consists of 17 invited lectures on selected topics, seven formal discussion sessions with discussion leaders and poster sessions on a range of topics. The discussion sessions will be on the following topics:

- Theoretical aspects of Raman scattering
- Biological systems
- Surface applications
- The solid state
- Industrial applications
- Reaction dynamics and transient species
- Superconductors

The fees for the meeting are expected to be approximately as follows: active participants GBP 100.00, students GBP 30.00 and accompanying persons GBP 25.00. The fee includes the proceedings which will be handed to participants on arrival at the conference.

The institute is situated in Bloomsbury in the heart of London. Residential accommodation in hotels (GBP 35.00 to GBP 75.00 per person per night — single room, bed and breakfast) and student halls of residence (GBP 18.00 per person per night — single room bed and breakfast) has been reserved within easy walking distance of the institute.

The conference programme includes an exhibition of equipment and an exhibition of memorabilia and material relating to C. V. Raman. A number of social events are also being arranged.

Medicinal plants and spices

The 6th Asian Symposium on Medicinal Plants and Spices (ASOMPS VI) will be held in Bandung, Indonesia from 24 to 28 January 1989 under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

The symposium is a continuation and follow-up of the previous five symposia. The first in the series was held in Peshawar, Pakistan in 1960, the second in Kandy, Sri Lanka in 1964, the third in Colombo, Sri Lanka in 1977, the fourth in Bangkok, Thailand in 1980 and the fifth in Seoul, Korea in August 1984.

The symposium aims to bring together scientists from all Asian countries to exchange information and ideas on recent advances and to establish contacts for liaison and future action on various aspects of medicinal plants and spices.

The 6th symposium will include the following major areas:

- Chemistry of natural products: isolation, structure elucidation, synthesis, and biosynthesis
- Pharmacology, pharmacognosy and microbiology
- Ethnopharmacology, taxonomy and agronomy of medicinal plants
- Current work on essential oils and spices
- Technology of medicinal plants and spices

All correspondence and requests for information concerning the symposium should be addressed to: Prof. Sjamsul Arifin Achmad, Department of Chemistry, Institute of Technology Bandung, Jalan Ganeca 10, Bandung 40132, Indonesia.

Nickel metabolism and toxicology

Helsinki, Finland, 5–9 September 1988

IUPAC SPONSORED

The 4th International Conference on Nickel Metabolism and Toxicology will be held at the Hanasaari Cultural Centre, Espoo, Helsinki. The conference continues the tradition of previous International Conferences on Nickel Metabolism and Toxicology. The first conference was held in Kristiansand, Norway in 1978, the second in Swansea, UK in 1980 and the third in Paris, France in 1984.

The conference will provide a forum for the exchange of information on recent advances in nickel biochemistry, metabolism, carcinogenicity, and immunotoxicity, as well as epidemiological studies of nickel workers and biological monitoring of nickel exposures in the workplace.

The scientific programme will consist of plenary and keynote lectures, 20-minute oral presentations, minisymposia and a formal poster session. Most of the sessions will be devoted to mainline nickel toxicology topics: metabolism, carcinogenesis, hypersensitivity, animal studies, analytical chemistry and biological monitoring and epidemiology. There will also be papers describing the isolation and characterization of nickel metalloenzymes.

Concurrent workshops are scheduled on specific topics such as characterization of nickel compounds employed in toxicological research, the interaction *in vivo* of nickel with other metals and Ni-63 autoradiography.

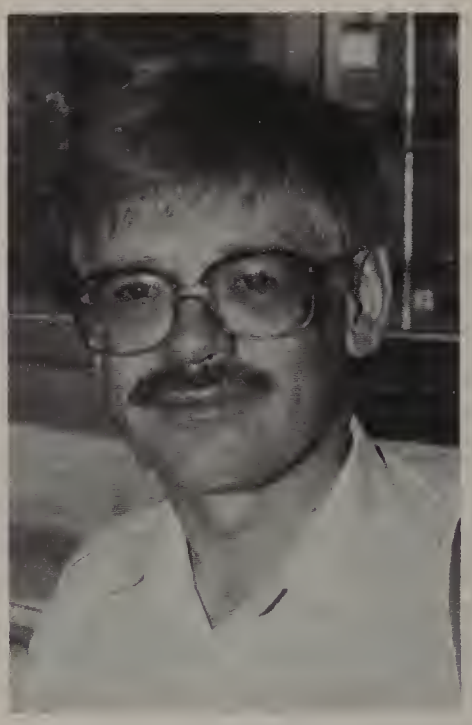
There will also be a special Sunderman Sr Symposium in honour of Dr F. W. Sunderman Sr for his "lifetime" contributions to and promotion of nickel toxicology. Dr Sunderman Sr will give a plenary lecture entitled "A pilgrimage into the archives of nickel toxicology".

The following are confirmed keynote lectures:

- Experimental nickel carcinogenesis (M. Costa, USA)
- Nickel hypersensitivity (T. Menné, Denmark)
- Mechanisms of immunological responses to nickel (S. Nicklin, UK)
- Epidemiologic aspects of nickel carcinogenesis (J. Peto, UK)
- Epidemiologic aspects of nickel carcinogenesis (R. S. Roberts, Canada)
- Biological monitoring (F. W. Sunderman Jr, USA)

The scientific programme also includes a visit to Pori and Harjavalta Works of Outokumpu Oy (Ltd).

The registration fee is FIM 350 for active participants and covers the book of abstracts, bus transportation to and from the conference site on working days, and the social events. The fee for accompanying persons is FIM 150. Accommodation is available in the Hanasaari Cultural Centre and local hotels.



Jorma Järvisalo, Secretary of the Clinical Chemistry Division and official IUPAC representative at the 4th International Conference on Nickel Metabolism and Toxicology, Helsinki.

A minimum of three **travel grants** (equal to USD 500 each) will be awarded to young participants currently in training (graduate students or post-doctorate fellows below 35 years of age).

The Hanasaari Cultural Centre, Espoo is about 7 km from Helsinki. In September the temperature in Helsinki is between +10 and +15°C. Rain can be expected.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1988

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France. (Prof. P. Caubère, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-lès-Nancy Cédex, France.)

Modified Polymers

5–8 July. 7th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia. (Dr A. Romanov, Polymer Institute, Centre for Chemical Research, Slovak Academy of Sciences, 842 36 Bratislava, Czechoslovakia.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia. (PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia.)

Yvan Guindon (Québec, Canada) who will be lecturing on "New synthetic applications of dialkylboron halide reagents" at the 7th IUPAC Conference on Organic Synthesis, Nancy, France, 4–7 July 1988.

Biotechnology

17–22 July. 8th International Biotechnology Symposium. Paris, France.
(8th International Biotechnology Symposium, c/o SOCFI, 14 rue Mandar, 7502 Paris, France.)

Photochemistry

17–22 July. 12th International Symposium on Photochemistry. Bologna, Italy.
(XII IUPAC Symposium on Photochemistry, c/o Prof. F. Bolletta, Dipartimento di Chimica "G Ciamician", Università di Bologna, Via Selmi 2, 1-40126 Bologna, Italy.)

Poly(Vinyl Chloride)

18–21 July. 31st Micro-symposium on Macro-molecules: Poly(Vinyl Chloride). Prague, Czechoslovakia.
(P. M. M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macro-molecules. Kyoto, Japan.
(MACRO 88 Secretariat, The Society of Polymer Science Japan, Honshu Building, 5-12-8 Ginza, Chuo-ku, Tokyo 104, Japan.)

Inorganic Ring Systems

8–12 August. 5th International Symposium on Inorganic Ring Systems. Amherst, Mass., USA.
(Prof. R. R. Holmes, Department of Chemistry, University of Massachusetts, Amherst, MA 01003, USA.)

Carbohydrates

14–19 August. 14th International Carbohydrate Symposium. Stockholm, Sweden.
(XIVth ICS 1988, c/o Stockholm Convention Bureau, Box 6911, S-10239 Stockholm, Sweden.)

Solution Chemistry

15–18 August. 19th International Conference on Solution Chemistry. Lund, Sweden.
(XIX ICSC, c/o Dr Ingmar Persson, Inorganic Chemistry 1, Chemical Center, POB 124, S-22100 Lund, Sweden.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Y. Ueno, c/o Inter Group Corp., Akasaka Yamakatsu Building, 8-5-32, Akasaka, Minato-ku, Tokyo 107, Japan.)

Thermal Analysis

21–25 August. 9th International Congress on Thermal Analysis. Jerusalem, Israel.
(The Secretariat — ICTA 9, PO Box 394, 61003 Tel Aviv, Israel.)

Physical Organic Chemistry

21–26 August. 9th International Conference on Physical Organic Chemistry. Regensburg, Federal Republic of Germany.
(Gesellschaft, Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Solubility Phenomena

23–26 August. 3rd International Symposium on Solubility Phenomena. Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Co-Chairman, Third International Symposium on Solubility Phenomena, Chemistry Department, University of Surrey, Guildford, Surrey GU2 5XH, UK.)

Coordination Chemistry

28 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. M. A. V. Ribeiro da Silva, XXVI ICCC, Department of Chemistry, Faculdade de Ciências, 4000 Porto, Portugal.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(IUPAC Conference, PO Box 119, CS-160 Praha 6, Czechoslovakia.)

Molecules and Molecular Crystals

29 August–3 September. International Symposium on the Electronic Structure and Properties of Molecules and Molecular Crystals. Cavtat-Dubrovnik, Yugoslavia.
(Prof. Z. B. Maksic, Chairman of the Organizing Committee, Ruder Bošković Institute, PO Box 1016, YU-41001 Zagreb, Yugoslavia.)

Macrocyclic Chemistry

4–8 September. 13th International Symposium on Macrocyclic Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, Varrentrappstr, 40–42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Organometallic Chemistry

4–9 September. 13th International Conference on Organometallic Chemistry. Turin, Italy.
(Prof. Luciano Milone, Istituto di Chimica Generale ed Inorganica, Facoltà di Farmacia, Università di Torino, Via P. Giuria 9, I-10125 Turin, Italy.)

Automation and New Technology in Clinical Laboratory

5–8 September. 3rd International Congress on Automation and New Technology in Clinical Laboratory. Kobe, Japan.
(Dr Kiyoshi Okuda, Department of Laboratory Medicine, Central Clinical Laboratory, Osaka City University Medical School, Abeno, Osaka 545, Japan.)

Nickel Metabolism and Toxicology

5–9 September. Fourth International Conference on Nickel Metabolism and Toxicology. Helsinki, Finland.
(Dr E. Nieboer, McMaster University, Department of Biochemistry, Health Sciences Centre, 1200 Main Street West, Hamilton, Ontario L8N 3Z5, Canada.

Raman Spectroscopy

5–9 September. XIth International Conference on Raman Spectroscopy. London, UK.
(Dr John F. Gibson, Secretary (Scientific) Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.)

Vapour–Liquid Equilibria

24–26 October. Fourth International Workshop on Vapour–Liquid Equilibria in 1-Alkanol + *n*-Alkane Mixtures: Applications. Thessaloniki, Greece.
(Prof. I. A. Vasalos, Chemical Process Engineering Research Institute and Department of Chemical Engineering, University of Thessaloniki, 54006 Thessaloniki, Greece.)

Surface, Adsorption & Chromatography

13–17 November. International Symposium on Surface, Adsorption & Chromatography (dedicated to the memory of A. V. Kieslev). Moscow, USSR.
(Prof. O. G. Larionov, Scientific Council on Chromatography, Institute of Physical Chemistry, Leninskii prospekt 31, 117915 Moscow, USSR.)

1989

Oils, Fats and Waxes

12–17 February. International Conference on Oils, Fats and Waxes. Auckland, New Zealand.
(Dr L. Eyres, c/-NZ Dairy Board, Cream Products Division, PO Box 417, Wellington, New Zealand.)

Cationic Polymerization

5–9 June. Ninth International Symposium on Cationic Polymerization and Related Processes. Strasbourg, France.
(Prof. J. Brossas, Institut Charles Sadron (CRM–EAHP) (CNRS–ULP), 6 rue Boussingault, 67083 Strasbourg Cedex, France.)

Fats

6–9 June. International Congress Chevreul or Study of Fats. Angers, France.
(Dr A. Karleskind, Centre de Congrès, 33 boulevard Carnot — 49100 Angers, France.)

Molecular Design of Functional Polymers

26–28 June. International Symposium on Molecular Design of Functional Polymers. Seoul, Korea.
(Secretariat, IUPAC International Symposium, c/o Polymer Society of Korea, Rm 601, Hyecheon Building, 831, Yeoksam-dong, Kangnam-ku, Seoul 135–792, Korea.)

Coordination Chemistry

2–7 July. 27th International Conference on Coordination Chemistry. Queensland, Australia.
(XXVII ICCC Conference Secretariat, UniQuest Limited, University of Queensland, St Lucia, Qld. 4067, Australia.)

Polymer Blends

17–20 July. 32nd Microsymposium on Macromolecules "Polymer Blends". Prague, Czechoslovakia.
(Dr P. Čefelín, PMM Chairman, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovskeho n. 2, 16206 Prague 6-Petriny, Czechoslovakia.)

Analytical Chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

IUPAC Congress

2–7 August. 32nd IUPAC Congress. Stockholm, Sweden.
(IUPAC, c/o Stockholm Convention Bureau, PO Box 6911, S-102 39 Stockholm, Sweden.)

Solution Chemistry

6–11 August. 20th International Conference on Solution Chemistry. Jerusalem, Israel.
(Prof. Y. Marcus, Department of Inorganic & Analytical Chemistry, The Hebrew University of Jerusalem, 91904 Jerusalem, Israel.)

IUPAC General Assembly

9–17 August. 35th IUPAC General Assembly. Lund, Sweden.
(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Ichiro Murata, Dept. of Chemistry, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan.)

Calorimetry and Chemical Thermodynamics

25–28 August. International Conference on Calorimetry and Chemical Thermodynamics. Beijing, China.
(Prof. Hu Ri-heng, Institute of Chemistry, Academia Sinica, Beijing, China.)

Mössbauer Effect

4–8 September. International Conference on the Applications of the Mössbauer Effect. Budapest, Hungary.
(Dr D. L. Nagy, Central Research Institute for Physics, PO Box 49, H-1525 Budapest, Hungary.)

1990

Natural Products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Prof. Sukh Dev, Malti-Chem Research Centre, Nandesari, Baroda-39340, India.)

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 900440, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical Organic Chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitshak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000 Israel.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

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Silicon Chemistry

Editors:
E. R. COREY and **J. Y. COREY**, Department of Chemistry, University of Missouri, St. Louis, USA, and **P. P. GASPAR**, Department of Chemistry, Washington University, St Louis, USA

This book introduces the important industrial uses of organosilicon chemistry which include the application of silicon as an agent for the alloying and de-oxidising of metals, the production of silanes and organo-metallic compounds, and its uses as a semi-conductor.

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Editors:
V. FÓA, Institute of Occupational Health, University of Milan, Italy; **E. A. EMMET**, Center for Occupational and Environmental Health, Baltimore, USA; **M. MARONI** and **A. COLOMBI**, Institute of Occupational Health, University of Milan, Italy

Significant progress in recent years of biochemical and epidemiological toxicology has led to the discovery of molecular targets and mechanisms of action of many environmental chemicals: and also to the development of knowledge on the biochemical changes to those exposed to a variety of environmental or occupational pollutants.

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Contents: Introduction; PART I — Biological Indicators of Dose and Effects: General Concepts; PART II — Biochemical Indices of Liver Toxicity: Enzyme Induction, Lipid Peroxidation and Other Indices Relevant to Liver Function Changes; PART III — Biochemical Indices of Liver Toxicity: Porphyrin Metabolism; PART IV — Biochemicals and Cellular Indices of Renal Changes Induced by Exogenous Chemicals; PART V — Biological Indices for Assessment of Human Genotoxicity Induced by Exogenous Chemicals; PART VI — Biochemical Indices of Nervous Tissue Toxicity and Exposure to Neurotoxicants.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 43 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International

IUPAC

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Front cover: This huge rotary filter forms part of Albright and Wilson's wet process phosphoric acid plant at Whitehaven, Cumbria, UK.

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Scientific materials for the Third World

Provision of scientific literature and equipment

Since its establishment, the International Centre for Theoretical Physics (ICTP) and the Third World Academy of Sciences (TWAS) have been engaged in promoting and sustaining research activities in different scientific disciplines in developing countries, by setting up a number of specific programmes designed to achieve this purpose.

Scientists living and working in developing countries are faced with the difficulty of obtaining scientific literature and adequate laboratory facilities. For this reason, ICTP has initiated a scheme for providing mathematics and physics libraries in developing countries with books, journals and equipment through the channels of its 'Books and equipment donation programme'.

The centre has made several appeals to libraries, publishing companies, laboratories and individuals to donate any books, journals, proceedings and equipment they no longer need, with ICTP acting as broker. The response to these appeals has been very encouraging.

As a result, ICTP has, over recent years, distributed a yearly average of approximately 14 000 journals, 4000 proceedings and 2000 books on mathematics and physics to over 200 developing countries. It is hoped that it will now be possible to increase distribution to over 50 000 books, journals and proceedings annually. During this period, ICTP has also forwarded to laboratories in developing countries a large number of different items of equipment which have been generously donated by various European laboratories.

TWAS programme includes chemistry materials

The Third World Academy of Sciences has recently joined this donation programme to expand it to the fields of biology and chemistry, so as to help provide libraries and laboratories in these disciplines in developing countries with scientific literature and equipment. Together with ICTP, TWAS has agreed to cover transportation costs of material which has to be sent to institutions in Third World countries.

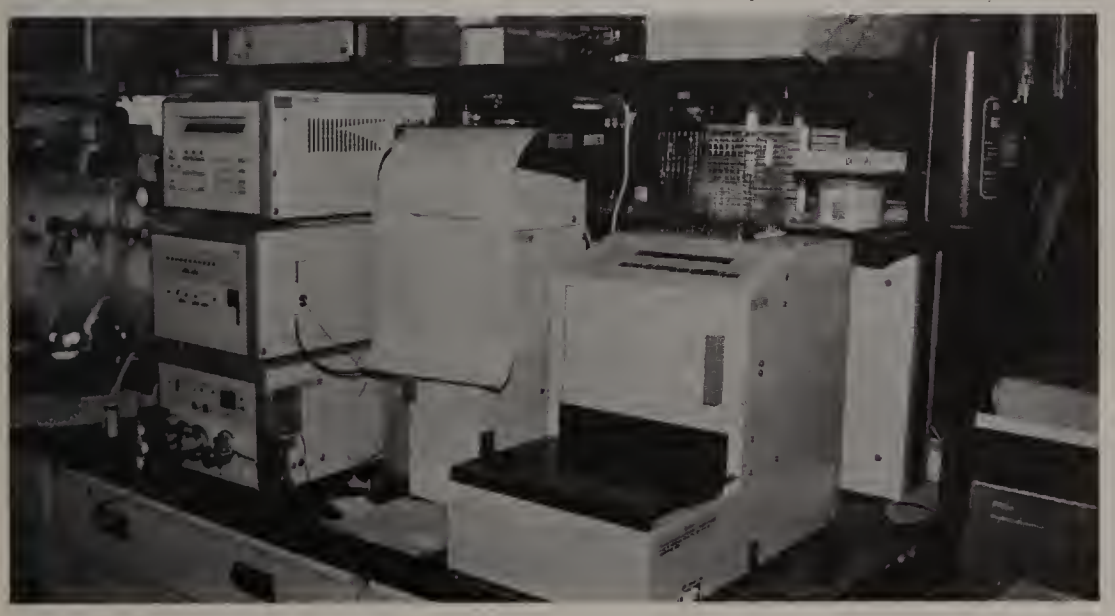
TWAS already has an ambitious and important scheme of donating scientific materials (books, journals and some equipment) to identified needy institutions in developing countries. In this programme TWAS buys new books and journal subscriptions (for example, it spent USD 175 000 on these in 1986) and accepts donations for these from individuals and/or institutions.

Scientific bodies in developing countries with their specific needs have been identified, and TWAS in cooperation with ICTP ensures that appropriate materials reach their destinations. The TWAS donation programme currently recycles some 50 000 books and journals annually to about 500 institutions in 90 countries. These materials are in the fields of mathematics, physics, chemistry, biology, engineering, and earth sciences.

More can be done

Although ICTP and TWAS are making every effort to alleviate the drastic situation in Third World universities, still more can be done. These countries require assistance, and there is no need to stress how useful the Donation Programme is and how precious help can be.

Those interested in helping by providing material in the fields of chemistry and/or the other subjects mentioned above should kindly contact: Prof. R. Dalafi, Third World Academy of Sciences (TWAS), c/o International Centre for Theoretical Physics, PO Box 586, 34100 Trieste, Italy.



The Third World Academy of Sciences is helping to provide libraries and laboratories in developing countries with scientific literature and equipment.

News & Views

CNC–IUPAC awards

The Canadian National Committee of IUPAC established the CNC–IUPAC Awards in 1982. The main purpose of the awards is to assist young scientists, who are beginning to establish an international reputation in their field, to actively participate in IUPAC-sponsored meetings.

The recommended, but not mandatory, upper age limit for the awardees is 37 years. Each award contributes to the winner's expenses to present a paper at a IUPAC-sponsored conference outside North America.

The 1988 winners are Raymond J. Andersen and Chris E. Orvig, both of the University of British Columbia; Mario Pinto of Simon Fraser University and Tom Ziegler of the University of Calgary.

Raymond Andersen's current research interests are in the areas of marine and terrestrial natural products chemistry. His group is actively engaged in the isolation and structure elucidation of novel biologically active secondary metabolites that have ecological importance, are implicated in folk medicines, or have potential applications in the pharmaceutical or agricultural industries.

With his award, Andersen attended the 16th International Symposium on the Chemistry of Natural Products in Kyoto, Japan, 29 May–4 June.

Chris Orvig's research interests are firmly centred in bioinorganic chemistry. His research group is making contributions to the study of metal ions which are involved in neurological diseases (Al) and in radiopharmaceutical imaging and diagnostic nuclear medicine (Ga, In, Tc). This work has led to the development of a ligand system that forms complexes with uniquely tunable properties and which is in wide use in the study of aluminium neurotoxicity.

He travelled to the 19th International Conference on Solution Chemistry in Lund, Sweden, 15–18 August 1988.

Mario Pinto's research interests span the areas of physical–organic and biological chemistry with special focus on conformational analysis. Specific programmes of research deal with the nature and origin of conformational effects and the synthesis and conformational analysis of oligo-saccharide antigenic determinants. He has made significant contributions to the systematic study of the "origin" of X–C–Y anomeric interactions, the investigation of the 3rd row anomeric effect, and the study of the conformations and properties of a new class of compounds, the selenium coronands (crown ethers).

Pinto used the award to attend the 7th International Conference on Organic Synthesis, Nancy, France, 4–7 July.

Tom Ziegler's research is directed towards the theoretical study of the structure and reactivity of transition metal complexes and the role they play in homogeneous catalysis.

He is using the award to attend the 26th International Conference on Coordination Chemistry, Porto, Portugal, 29 August–2 September.

Alison Clayson, Publications/Press Officer at the headquarters of the International Council of Scientific Unions (ICSU) in Paris, stopped by at the IUPAC Secretariat in Oxford in April. She learned about the IUPAC Affiliate Membership Scheme and discussed ways of improving the flow of information between the two organizations.

As editor of *Science International*, Clayson wants to expand the newsletter's coverage of ICSU family activities. She was in Oxford to attend a meeting of the ICSU Press Board of Management. The Press has co-publication arrangements with a number of Oxford-based publishers and was founded in 1983 as a service to the ICSU community.

Safety in chemical production

Plans are well under way for a IUPAC-sponsored conference on "Safety in chemical production: risk assessment, risk reduction, implications on education" to be held in Basle, Switzerland. The provisional date for the conference is 10–14 September 1990.

The Committee on Chemistry and Industry (COCI) will function as a nucleus for the conference steering committee. In addition, an organizing committee will be formed to finalize the programme. The actual organization will be handled by a professional congress organization.

The conference will span three days with an optional fourth day:

Day 1: invited lectures on risk assessment and risk reduction — mostly by industrial experts.

Day 2: detailed case studies, including visits to modern chemical plants in small groups with mentors from industry.

Day 3: safety education: invited and contributed papers on actual examples of safety education in universities and in industry.

Day 4: (optional) workshop on "how to improve the incorporation of safety matters into chemical education".

COCI envisages that about 200 participants will attend the conference — mainly by invitation. These will include participants from developing countries. The conference language will be English. On the second day case studies may also be given in French and German.

James Bull visits IUPAC Secretariat

Dr James R. Bull

Dr James Bull, President of the South African Chemical Institute and Chairman of the IUPAC National Committee in South Africa, visited the IUPAC Secretariat in Oxford, UK in April. Amongst the topics discussed was the operation of the affiliate membership scheme in South Africa. This year, 265 chemists in the country have registered as affiliates compared to 240 last year.

In February, Bull took up his appointment to the Mally Chair of Organic Chemistry at the University of Cape Town. Before, he was Chief Director of CSIR's National Chemical Research Laboratory. He is also currently a titular member of the IUPAC Commission on Nomenclature of Organic Chemistry (III.1).

Invited lectures on risk assessment and risk reduction will be given by industrial experts at the COCI conference on safety in chemical production.

Cuba joins affiliate membership scheme

Cuba has joined the IUPAC affiliate membership scheme. Dr Alberto Nuñez Sellés, the National Affiliate Membership Secretary in Cuba, has submitted the names and addresses of 25 young chemists for the IUPAC affiliate membership scheme. These were nominated by the Cuban Chemical Society whose President is Dr Ruth Henriques. The 25 memberships were made possible as a result of funds made available by IUPAC.

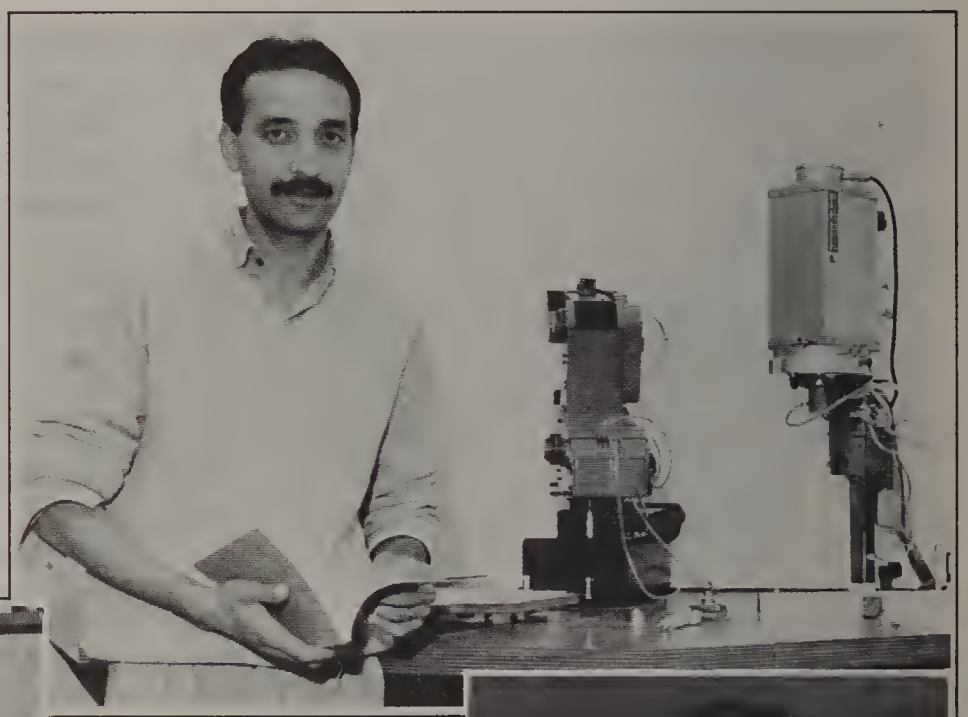
Nuñez Sellés is Head of the Analytical Chemistry, National Scientific Research Centre, Havana. His specific interests are microchemical techniques and trace analysis. He was a participant at the 31st IUPAC Congress held in Sofia, Bulgaria, July 1987.

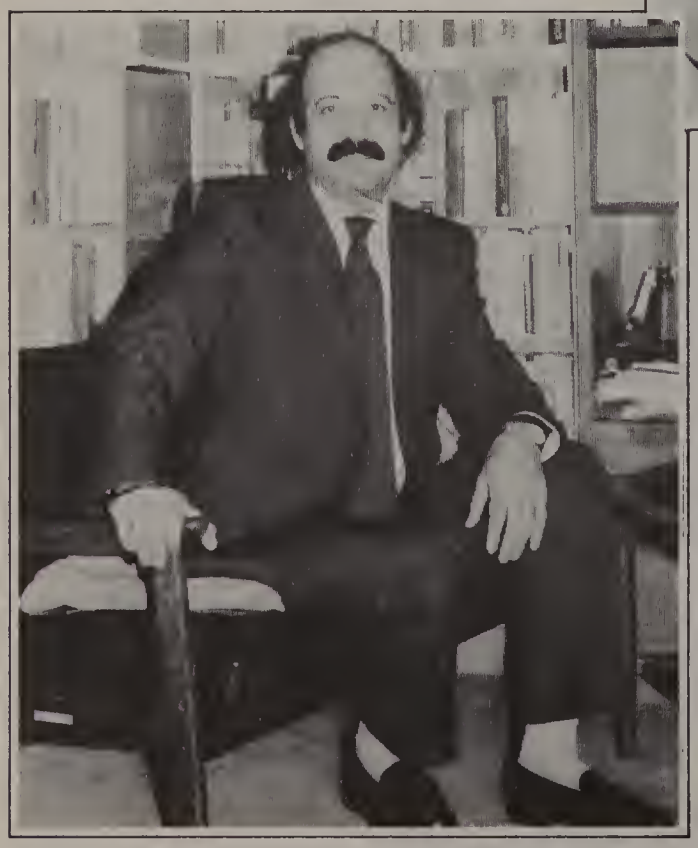
Dr Alberto Nuñez Sellés at the Sofia Congress.

Cuba is one of 43 member countries of IUPAC: the national adhering organization is Academia de Ciencias de la República de Cuba.

IUPAC Affiliates

Dr Gurinder Doad is a graduate of the University of Salford, UK with a BSc degree in Biochemistry and Chemistry. He obtained a PhD degree in synthetic organic chemistry from the same university in 1986. In 1985 he was a steward at the IUPAC Congress in Manchester. He currently holds a post-doctoral position in synthetic organic chemistry at the University of South Florida, Tampa, USA.





Dr Sardar Bahador obtained his BSc at the Faculty of Science, Kabul University, Afghanistan. Since 1974 he has carried out research on ceramics, textile fibres, electrode processes and photochemistry. He is currently a researcher at Kyoto University, Japan. As an affiliate he has registered an interest in the work of the Commission on Electrochemistry.

Rafi Traboulssi is a PhD student at the University of Surrey, UK working under the supervision of Dr Angela Danil de Namor (see page 48, March 1988 issue of *CI*). He is sponsored by the Hariri Foundation which has its headquarters in Beirut, Lebanon. His family live in Nabatieh in the south of Lebanon. He is doing research on antibody–antigen interactions.

Striding purposefully backward into the sunset

IUPAC's ever vigilant Executive Secretary Dr Mo Williams recently spotted the following paragraph in the minutes of one of the Boston General Assembly meetings:

> "The outgoing Chairman and Secretary, victims of the '12-year rule', thanked the Committee for its continuous good work and friendship in a now no longer thankless task, wished the incoming Chairman and Secretary well, and strode purposefully backward into the sunset."

This is the final paragraph of the minutes of the Boston IDCNS meeting submitted by retiring IDCNS Secretary Bob Fox. IDCNS is the Interdivisional Committee on Nomenclature and Symbols.

In pursuit of sanity

Jack H. Stocker, an observer at the Boston meeting of the Commission on Nomenclature of Organic Chemistry, loves to wear humorous badges. The one pinned to his shirt in this photograph reads:

> This neurotic pursuit of sanity
> is driving us all crazy.

The picture was taken at dinner following the CNOC and CNIC (Commission on Nomenclature of Inorganic Chemistry) tour during the Boston General Assembly (see p. 107 of the May 1988 issue of *CI*).

What is rDNA?

> "The increasingly frequent use of the term recombinant DNA in the scientific literature has led to the appearance of the abbreviation rDNA to denote both the technology itself and the DNA molecules that result from it. However, the same abbreviation was pre-empted some time ago to refer to ribosomal DNA, the genes coding for ribosomal RNA. Because rRNA is already a widely used biochemical abbreviation, it is a natural extension to designate rDNA for ribosomal DNA. Thus we would discourage the use of rDNA to refer to recombinant DNA. While alternative abbreviations for recombinant DNA have been suggested (see King, R. C., 1986. *Nature (Lond.)*, **322**, 780), it hardly seems necessary to have any standard abbreviation for such a broad class of techniques and molecules."

(The above paragraph appeared in the Nomenclature Committee of IUB (NC–IUB) and IUPAC–IUB Joint Commission on Biochemical Nomenclature (JCBN) *Newsletter* 1988 which was published in *Eur. J. Biochem.* **170**, pp. 7–9, 1987.)

IFCC documents

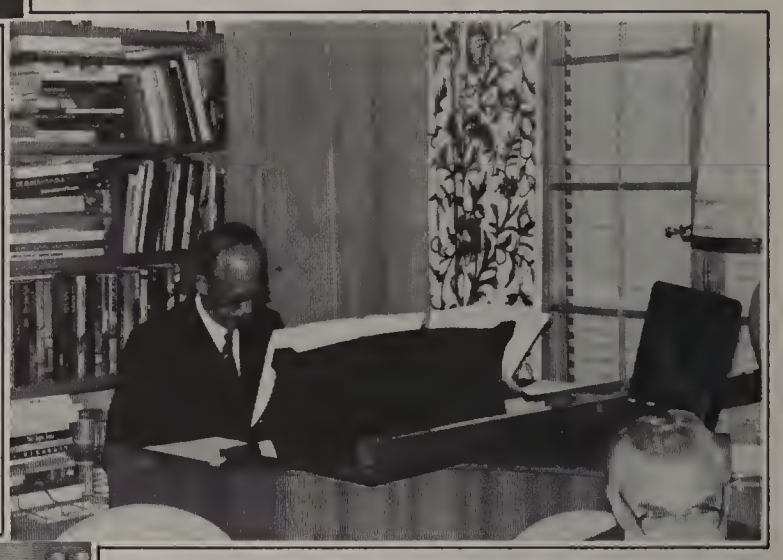
The following four International Federation of Clinical Chemistry (IFCC) documents have been published in *J. Clin. Chem. Clin. Biochem.*, Vol. 26, No. 3, 1988. They were prepared for publication by the IFCC Education Committee/IUPAC and Committee on Drug Effects in Clinical Chemistry respectively.

- IFCC 1988/1. Guidelines (1986) for the preparation of aims and objectives for the teaching of clinical chemistry (pp. 163–167).
- IFCC 1988/2. Drug interferences and drug effects in clinical chemistry. Part 3. Evaluation of biological effects of drugs (pp. 169–173).
- IFCC 1988/3. Drug interferences and drug effects in clinical chemistry. Part 4. Clinical laboratory tests on laboratory animals during toxicity studies (pp. 175–179).
- IFCC 1988/4. Drug interferences and drug effects in clinical chemistry. Part 6. Laboratory tests in monitoring drug administration (pp. 181–186).

In addition, IFCC Document (1986), Stage 2, Draft 3: "The effect of instrumental and environmental factors on the thermal regulation of the temperature of incubation" was published in *J. Clin. Chem. Clin. Biochem.* Vol. 25, No. 11, pp. 829–834, 1987.

IUPAC's finance team

Dr Alfred Hartmann (Director General, Rothschild Bank in Zürich) receives a commemorative porcelain plate from his colleagues in the Finance Committee, to mark his outstanding service (1979–1987) to the Union. Also in the picture (from left): Dr Fred Wilson (Chairman, Finance Committee); Prof. Anders Björkman (IUPAC Treasurer); Mrs Claudine Hartmann; and Dr Wolfgang Fritsche (Finance Committee member).



The IUPAC Treasurer takes a rest from his official responsibilities for composing the Union's accounts and budgets.

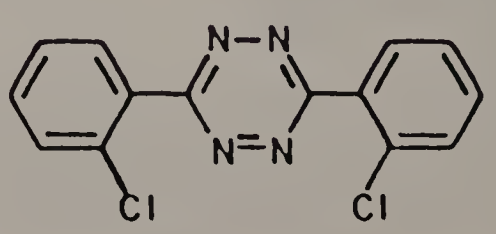
New faces in IUPAC's finance team (from left): Mr Erwin Letter (IUPAC accountant at SBG); Dr Josef Brunner (Finance Committee member: a management economist at F. Hoffman-La Roche & Co., Basel, Switzerland); and Mr Kurt Hedinger (IUPAC portfolio manager at SBG).

The Finance Committee meets annually in Zürich, Switzerland — in 1988 on 15th and 16th February — at the offices of its official banker, Schweizerische Bankgesellschaft (SBG), to receive the statement of accounts for the previous year, to review the Union's investment portfolio and forward budgets, and to make recommendations on other matters of financial importance to IUPAC (for example, national subscriptions and per diem allowance for meetings).

Apollo

This is an example of a literature-derived name. It was one of several examples in a poster entitled "What's in the number and the name found in the CAS Database" presented by Dr W. Val Metanomski at the American Chemical Society meeting in New Orleans, USA in September 1987 (see also, *CI*, pp. 211–215, November 1987).

$C_{14}H_8Cl_2N_4$



We regret to record the death of:

Prof. V. A. Medvedev, USSR (24 February 1988) — Commission on Thermodynamics (1977–1988).

Prof. J. E. Zajic, USA (24 March 1987) — Commission on Biotechnology (1977–1983).

Philippine Chemistry Congress

The 4th Philippine Chemistry Congress, sponsored by the Philippine Federation of Chemical Societies, was held on 26–28 May at the People's Center, Tacloban City, Philippines. This year's theme was "The chemist as entrepreneur".

The congress brought together once again chemists, chemistry teachers, students and practitioners from all over the country to discuss issues facing academe, industry and the profession — with the hope of resolving them. Simultaneous sessions on science and entrepreneurial opportunities were held.

Address changes

Dr E. D. Becker (Chairman, Committee on Publications). Fax: +1 (301) 480 1850.

Prof. A. Björkman (Treasurer). +45 42 88 41 44.

Dr L. R. P. Butler (Secretary, Commission on Spectrochemical and Other Optical Procedures for Analysis). PO Box 17063, Groenkloof, 0027, Republic of South Africa. Tel: +27 (12) 46 2507.

Prof. A. E. Fischli (Secretary, Committee on Chemistry and Industry). Gastroenterology and Metabolism Research Department, F. Hoffmann-La Roche & Co. Ltd, Grenzacherstrasse 124, CH-4002 Basel, Switzerland. Tel: +41 (61) 688 21 82. Fax: +41 (61) 691 93 91.

Prof. G. Gritzner (Chairman, Commission on Electrochemistry). Telex: 2 2323 UNILI A.

Dr A. J. Head (Secretary, Subcommittee on Reference Materials in Chemistry). Tel: +44 (372) 52514.

Prof. Y. P. Jeannin (Vice-President). Lab. de Chimie des Métaux de Transition, Université Pierre et Marie Curie, 4 place Jussieu, F-75252 Paris Cédex 05, France.

Dr P. C. Kearney (President, Applied Chemistry Division). Telex: 7401044 VIA CCI.

Prof. J. W. Lorimer (Chairman, Commission on Solubility Data). Fax: +1 (519) 661 3022.

Prof. M. Mandel (Chairman, Commission on Polymer Characterization and Properties). Fax: +31 (71) 274537.

Dr L. D. Pettit (Chairman, Commission on Equilibrium Data). Tel: +44 (532) 336403.

Dr A. E. Pohland (Chairman, Commission on Food Chemistry). Fax: +1 (202) 426 1658.

Prof. T. Saegusa (President, Macromolecular Division). Fax: +81 (75) 761 8145.

Dr D. Wyrsch (Chairman, Committee on Chemistry and Industry). Tel: +41 (61) 696 26 41. Fax: +41 (61) 37 74 44.

Letter to the Editor

Measuring the 'Amount of X' in mole units

Sir,

Two ways of describing the amount of a substance are to specify its mass or its volume. These specifications may be expressed in terms of the SI units kilogram or cubic metre, respectively. The significance of these units is easily understood, because they can be perceived by direct observation.

A third way of describing the amount of a substance is to compare the number of elementary, constituent entities to the number of entities in a reference element. The SI unit for that measure of amount is the mole. In contrast to the other two, this quantity can only be measured in an indirect way, and that is a reason why many students find it confusing. The 'quantity-measured-in-moles' has been called the 'amount of substance', but that designation is apt to compound the confusion, since the word 'amount' can properly refer to any one of the three quantities being discussed. To avoid this difficulty, a number of alternative designations have been proposed[1], but none of these proposals has been widely adopted.

In the new edition of the 'Green Book'[2], the competent commission is now recommending that the quantity in question might alternatively be called the 'amount of *X*', where *X* is the chemical formula of the substance and/or the constituent

entity. The following equalities may be written in terms of the terminology and symbols recommended in the 'Green Book':

(amount of substance) = (amount of X) = n = mass/(molar mass) = m/M

So, for example, the 'amount of H_2O' in 18.01 g is given by:

18.01 g/(18.01 g mol^{-1}) = 1.000 mol

This alternative designation for n may prove to be a more generally acceptable addition to chemical terminology, and it should facilitate the task of 'teaching the mole'[3].

George Gorin
Oklahoma State University
USA

1. See, e.g., Gorin, G., 1982. *J. Chem. Educ.*, **59**, 508.
2. Mills, I., Cvitaš, T., Homann, K., Kallay, N. & Kuchitsu, K., 1988. *Quantities, Units and Symbols in Physical Chemistry*, Blackwell Scientific Publications, Oxford, pp. 37, 41.
3. Dierks, W., 1981. *Eur. J. Sci. Educ.*, **3**, 145–8.

Chemistry in Cameroon

During the CHEMRAWN VI conference in Tokyo, Cameroon National Affiliate Membership Secretary Michel Belombé talked to *Chemistry International* about his work at the University of Yaoundé and expressed his views on the problems of science and development in the country.

Cameroon has 25 IUPAC affiliates — all of whom are at the Departments of Inorganic and Organic Chemistry at the University of Yaoundé. Their National Affiliate Membership Secretary, Michel Mégnamisi-Belombé, is a senior lecturer in inorganic chemistry at the university.

Belombé was born in December 1942 in Ndikinimeki, Cameroon. He attended a primary school in Ndikinimeki and then a secondary school in Yaoundé. In 1963 he went to the University of Heidelberg, FRG where he obtained BSc and MSc degrees in chemistry and, in 1974, a PhD.

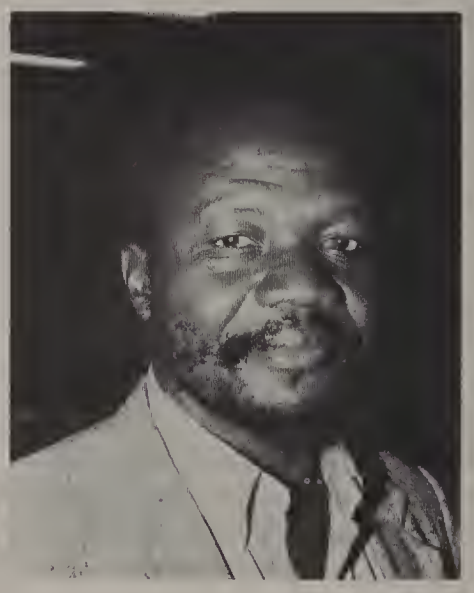
Following this, he spent four years at Stanford University, California, USA doing post-doctoral research in the Department of Physics. From 1975 to 1978 he was Senior Lecturer in Chemistry at the University of Ife, Ile-Ife, Nigeria.

Research problems

Belombé has published about 35 papers on solid state coordination chemistry in renowned scientific journals. However, at the University of Yaoundé, he has experienced numerous problems in pursuing his research interests. For a start there are few laboratories at the university and space is very limited. There is little equipment although he did receive a grant from Volkswagen for three years as part of an aid project.

"Water for washing glassware has to be stored in containers."

Even more acute is the lack of provision of basic services. Electricity and water are scarce. Water for washing glassware has to be stored in containers. Cooling with ice is difficult if not impossible at times. Belombé experiences problems in obtaining even the simplest of chemicals. On top of all this there is little scientific literature at the university and practically no trained technical personnel.



Michel Belombé: trying to inculcate the scientific spirit and promote scientific awareness in Cameroon.

Cameroon and Yaoundé

The Republic of Cameroon lies in West Africa next to Nigeria. It has a population of about 10 million. The country's raw materials include oil, bauxite and iron ore. Its capital is Yaoundé.

Teaching at the University of Yaoundé is in both English and French. The university has about 1500 chemistry undergraduates at various centres throughout the country. The Department of Inorganic Chemistry has 20 lecturers.

Primitive living conditions

When Belombé returned to Cameroon he found living conditions primitive compared to those he had experi-

enced and become used to in Heidelberg. He is not married and lives with relatives in a one-room house in Yaoundé. The house has no water, electricity or cooking facilities. The toilet is a hole in the ground outside the house.

Belombé arrives at the university at about 9.00 am each day. He has a car but it is broken down and he is unable to get it repaired. His diet consists of African foods such as yams and plantain plus fish, beef, water, beer and coffee. He relaxes by reading scientific journals and magazines and political news. He also likes to visit friends and travel around Cameroon — by bus.

The future

According to Belombé, the existing problems in Cameroon are partly the result of the attitude of the Cameroon people. In his view the people are more interested in consumption of imported products such as fast cars rather than development of their own resources.

Belombé feels strongly that the process of development should be carried out by the Cameroonians. However, this means sacrifices from each and every one in the country: "We must not just sit here in Africa and wait for the United Nations or some rich developed country to come around and help us to produce foods for daily consumption."

These problems also extend to science. He thinks there is a lack of creative scientific spirit in the country. When attempts are made to be creative they are often frustrated by the establishment. Even so, Belombé sees it as his duty to help inculcate the scientific spirit and promote scientific awareness in his country. This is a difficult task — although initiatives such as the IUPAC affiliate membership scheme are certainly helpful.

Belombé feels desperate and rather alone at times. In his view he does not think in the way most people in his country think. He hopes that he will be able to produce scientific results which will stimulate young people in his country to become more scientifically creative and thus help technological development in Cameroon. One way of helping to foster this spirit is to encourage young scientists to travel to meet other scientists in the international scientific community.

Chemical research applied to world needs

CHEMRAWN

CHEMRAWN, which stands for "CHEMical Research Applied to World Needs", is the title of a series of IUPAC-sponsored conferences. In March this year the CHEMRAWN Committee met in London to review CHEMRAWN activities and plan for the future. CHEMRAWN secretary Bob Marchessault reports on the meeting. In this feature on CHEMRAWN we also take a look at the perspectives, recommendations and proceedings of recent CHEMRAWN conferences.

CHEMRAWN Conference on Atmospheric Chemistry

The CHEMRAWN Committee met in London on 24–25 March to review the results of its six major conferences over the past decade. CHEMRAWN has become an IUPAC feature which has a special conference format on matters of world importance.

Each conference has a future actions group responsible for the wide circulation of conference documents known as *Perspectives and recommendations*. These documents disseminate the major conclusions and actions of the CHEMRAWN conferences and aim to influence decision makers and support local workshops.

Plant chemical safety is now planned as a COCI sponsored conference for 1990 (see page 169). Accordingly, CHEMRAWN, under the lead of past IUPAC president Bill Schneider has focused on atmospheric chemistry as a world issue.

The topic of hydrofluorocarbon (HFC) atmospheric pollution has been targeted as a result of the recognized ozone layer depletion. This recognition and the danger it implies for world health led to the Montreal Protocol meetings. This was an attempt

The CHEMRAWN meeting in London.

The CHEMRAWN conferences

CHEMRAWN I	Future sources of organic raw materials, Toronto, Canada, 1978.
CHEMRAWN II	Chemistry and world food supplies: the new frontiers, Manila, Philippines, 1982.
CHEMRAWN III	Resources material conversion, The Hague, Netherlands, 1984.
CHEMRAWN IV	Modern chemistry and chemical technology applied to the ocean and its resources, Keystone, Colorado, USA, 1987.
CHEMRAWN V	Current and future contributions of chemistry to health, Heidelberg, FRG, 1986.
CHEMRAWN VI	Advanced materials for innovation in energy, transportation and communications, Tokyo, Japan, 1987.

to achieve a world consensus on the cessation of HFC manufacture. Other atmospheric problems such as the "greenhouse effect" and "acid rain" convinced the committee that the atmospheric chemistry problem had become a world priority. At least one major industrial producer of these chemicals has indicated willingness to support the conference and its objectives.

A subcommittee involving Bill Schneider, Ruby Pariser and Bob Marchessault was formed to provide final recommendations concerning the objectives, scope and venue by June. The subcommittee is seeking the active involvement of the Commission on Atmospheric Chemistry.

An important CHEMRAWN event took place 18–21 July in Nairobi with a Workshop on World Food Supplies. This was a follow-up to the Manila CHEMRAWN II Conference and was partly supported by a budgetary surplus. The meeting brought together African decision-makers and academics to focus on applications of the Manila Conference *Perspectives and Recommendations*. Besides IUPAC and the United Nations, the United States is also a major supporter of the workshop.

CHEMRAWN officers

John Thomas (Chairman) ▲

▲ Bob Marchessault (Secretary)

Alan Hayes (Vice-Chairman) ▶

The London meeting received a detailed report from COCI chairman Dieter Wyrsch concerning the "Safety in chemical production" meeting. This will take place in Basel, Switzerland with equal involvement from Third World countries, industry and government regulatory agencies. CHEMRAWN pledged its full support and agreed to schedule follow-up workshops.

IUPAC Treasurer Anders Björkman attended the London meeting as an ex-officio committee member. Following a review of CHEMRAWN finances, the chairman requested a formal statement of "financial principles". This is intended as a clear statement of how CHEMRAWN should be self-financing through contributions received from "budgetary surplus" deriving from each conference.

Professors Kuznetsov and Saito were welcomed as two new associate members. The committee is seeking broader representation from developing countries.

Bob Marchessault

Ocean chemistry

CHEMRAWN IV

Oceanic free radicals, marine particle surfaces and air–sea interfaces were amongst the topics discussed at the CHEMRAWN IV conference held in Colorado, October 1987.

The CHEMRAWN IV conference and workshop on "Modern chemistry and chemical technology applied to the ocean and its resources" was held in Keystone, Colorado, USA, from 5 to 9 October 1987 (see pages 196–205 of the September 1987 issue of *CI*).

The meeting aimed to stimulate interaction between ocean chemists and pure and applied chemists with the purpose of identifying new techniques and concepts that may be applied to critical ocean measurement. It also aimed to highlight the applications of modern chemical theory to ocean and Earth system problems.

The workshop consisted of five panels each considering one of the following topics:

- Oceanic free radical chemistries, especially those induced by sunlight.
- The nature and reactions of marine particle surfaces.
- Air–sea interface chemistries.
- Models of sea water including irreversible thermodynamic systems.
- Sea–sediment interface chemistries.

The full proceedings of CHEMRAWN IV were published in *Applied Geochemistry* Volume 3, Number 1, January/February 1988. The following are abstracts of five of the panel presentations.

The Plymouth Marine Laboratory coastal research vessel RV *Squilla*. The oceans contain a vast, complicated array of chemical species. New technologies for examining ocean chemical reactions were discussed at CHEMRAWN IV.

Upper ocean free radical chemistry

The oceans contain a vast, complicated array of chemical species. Heterogeneity is also apparent in the size distribution of these materials: they range from low to high molecular weight soluble compounds and extend up to microscopic and macroscopic aggregates.

It is likely that many (perhaps most) organic chromophores capable of sensitizing radical formation are part of high molecular weight or aggregated materials. In this situation the primary photo-chemistry as well as many secondary reactions, presumably, will occur within the matrix of the material.

The extent to which photochemical equivalents are transferred to components in the external aqueous phase will depend on such factors as the kinetics of 'intramolecular' recombination and disproportionation, the concentration of external elec-

tron donors/acceptors and their rates of diffusion into the matrix, and/or the ability of donors/acceptors to interact with the material through strong non-bonding interactions (e.g. hydrophobic association). Also, the local properties of these microscopic reaction sites may differ dramatically from those of the surrounding aqueous phase.

These differences could lead to reactions that normally would be unexpected for an aqueous milieu. For example, superoxide is a poor nucleophile in water, but a powerful one in aprotic environments.

These possibilities are the basis for the following questions for discussion:

- Do heterogeneous reaction pathways dominate oceanic free radical chemistry and photochemistry, or do they play only a minor role? How might this be tested?
- What techniques are available for measuring 'localized' or interfacial reactions? What are their levels of sensitivity?
- Similar chemical processes may take place at the air–sea boundary. What new technologies are available for examining (photo)chemical reactions in surface films and monolayers?

Neil V. Blough
Woods Hole Oceanographic Institution
USA

The nature and reactions of marine surfaces: unresolved problems

1. We have, as yet, very little information on the binding mechanisms responsible for reactive element scavenging by marine particles. Various lines of indirect evidence suggest that surface film coatings of organic matter may act as binding ligands to alter the inherent surface chemistry of the particles. On the other hand, we have laboratory evidence which suggests not, but implicates surface-adsorbed metal ions as binding sites for organics! We need techniques to study ion-binding by real surfaces under natural conditions.
2. The dynamics of the scavenging process are still poorly understood. Most uptake studies indicate adsorption over much shorter time-scales than can be inferred from radionuclide filed data. What is happening to adsorbed/absorbed elements inside the heterogeneous particle phases once scavenged? Is overall uptake enhanced by longer-term chemical transformations, a kind of water-column diagenesis? Possibilities include the surface precipitation of new mineral phases within the particle aggregate.
3. The physical and electrical properties of small riverine particles are profoundly altered when they enter the sea, with demonstrable effects on particle size and colloidal state, e.g. iron. What are the factors which determine the rate of particle interaction, the size and morphology of aggregates? We do not have the theoretical understanding to deal with aggregation of a heterogeneous, polydisperse system in a medium of changing ionic strength. What is the practical significance of aggregation in terms of shelf sedimentation?
4. Surface organic films on particles look like being great solvents for organic pollutants. What is the importance of organic scavenging by particles? Does it provide a short-circuit into the food-chain? Can we develop suitable tracers to study organic scavenging?
5. The role of bacteria in the development and maintenance of surface organic films on particles is poorly understood in terms of their effect on surface chemistry. To what extent are bacteria responsible for secondary transformations of adsorbed material, e.g. redox reactions, mineral formation?

Keith A. Hunter
University of Otago
New Zealand

Modelling the dynamics of ocean systems

Our main concern in modelling the chemistry of the oceans is to understand the resilience of the system to natural and man-made changes.

Substantial progress has been made in the development of baseline models for seawater using thermodynamic equilibrium concepts. The main problems that remain here relate mainly to the lack of appropriate experimental data, although more thought does need to be given to experimental verification.

"Our main concern in modelling the chemistry of the oceans is to understand the resilience of the system to natural and man-made changes." Michael Whitfield, Deputy Director of the Plymouth Marine Laboratory, UK.

The application of equilibrium models to marine systems has highlighted many important examples of chemical processes maintained far away from equilibrium. The main challenges to the modeller now lie in assessing the dynamics of the system by providing (a) a proper assessment of kinetic controls on chemical processes and (b) an accurate representation of the interaction between biological processes and the chemistry of the oceans.

Numerical procedures for modelling many interrelated rate processes are routinely used for simulating gas phase reactions in atmospheric chemistry and have been applied to a lesser degree to rapid photochemical processes in seawater. For the slower reactions more commonly encountered, the experimental data are lacking.

The traditional procedure of determining initial reaction rates with relatively concentrated reactants in simple media is probably not applicable to a system that contains the whole periodic table and a variable, largely uncharacterized mixture of organic compounds and where reactant concentrations are often in the sub-nanomolar range.

Proper account must be taken of medium effects and of the significance of component activities rather than component concentrations. The extremely wide range of reaction times (milliseconds to millenia) that are significant, also gives rise to poor coupling between the various processes.

Influence of biological processes

For most elements, the influence of the biota is dominant in dictating their cycling and geochemistry in the oceans. Biological processes interfere with the orderly progress towards equilibrium by accelerating selected chemical processes and retarding others (either following or moving contrary to the prevailing free energy gradient). They influence chemical speciation (and hence biological availability) by producing metastable redox states and by releasing a wide range of organic compounds capable of complexing trace metals. They also produce a steady flux of particles from the surface layers which incorporate many trace elements and act as sites for scavenging processes in the deep ocean.

Our modelling of trace metal interactions with ill-characterized polyfunctional organic compounds and particle surfaces is, at best, descriptive. We have only a primitive understanding of the modes of incorporation of trace elements into the particulate phase and of the extent to which the availability of trace elements limits the productivity of the oceans.

In short, we have not come to terms with the fact that biological processes both influence, and are influenced by, the chemistry of the seawater medium so that feedback and control mechanisms are possible and might play an integral part in the evolutionary process. To take proper account of the dominant role played by biological processes, we must also consider methods for modelling the heterogeneity of the oceans.

We need to develop procedures for matching the time and space scales of chemical, physical and biological processes so that we can understand the natural causes of variability and, hence, of the resilience of the system to change. Many of the concepts of chemical reactor and control theory could be productively applied here.

Michael Whitfield
Plymouth Marine Laboratory
UK

Problems in chemical oceanography and marine chemistry

Organic nitrogen. The rivers carry appreciable amounts of organic nitrogen which is more or less refractive. This nitrogen has to be characterized both chemically and biologically as a source of nitrogen nutrient. Its importance in the nitrogen cycle has to be elucidated. For high-precision alkalinity titration its acid–base properties should be known. It seems humic substances that are formed in fertilized soils contain several per cent of organic nitrogen.

Isomers. The methods to separate and determine optical isomers (racemates, enantiomers, diastereomers) are being advanced particularly by the great interest of the pharmaceutical industry. Such methods (e.g. liquid chromatographic) should be of prime interest for marine chemists.

Sulfur chemistry. Our knowledge of the role of sulfur (and selenium) in marine biochemistry is not sufficient. The function of some sulfur compounds (e.g. methionine) in living organisms is known, but in other cases (e.g. their metal binding functions) the knowledge can be improved. The routes by which dimethylsulfide and carbonyl sulfide (COS, carbon oxysulfide) are formed and decomposed should be further studied. A comparative study of CO_2 and COS might be fruitful.

Our knowledge of the sulfide complexation of metal ions is not too good, and certainly not sufficient for the evaluation of the chemical state of trace metals in sulfidic seawater.

Fluxes. For the understanding of the dynamics involved in the circulation of elements and compounds on a global scale it is vital to determine the fluxes. Thus it is not sufficient to measure a depth profile somewhere in the sea. Also the steady state concept should be used carefully. We really do not know if we are at present in a transfer from one

state to another. Hydrothermal activities and glaciation are two examples of global processes that vary.

Chemical tracers is one way to measure fluxes and mixing processes, and new analytical techniques and probes should be most helpful.

Carbon dioxide. The concentration of carbon dioxide in the atmosphere is well measured and the variations sufficiently well known on a global scale. Our knowledge of the variations in surface seawater should, however, be improved. A suitable probe should be developed in order to monitor these variations.

I would not like to say that one problem is more important than another. Since the fluxes are related to each other, you need better knowledge in many areas of chemistry and oceanography.

David Dyrssen
University of Göteborg
Sweden

Chemical analysis near the sediment–water interface

Analytical methods used to determine concentrations of chemical species near the sediment–water interface should, preferably, have good spatial and temporal resolution. Examples of methods, which have these desired characteristics, are the microelectrode-based measurements of oxygen and pH, which can be performed with a spatial resolution of a few micrometres, and in the case of oxygen, also with temporal resolution of a fraction of a second.

Unfortunately, most ion- or gas-specific electrodes do not exhibit sufficient selectivity and sensitivity to be used in marine environments. Sulfide microelectrodes have been used for analysis in benthic microbial mats where the sulfide concentrations are very high, but it should be possible to develop microelectrodes which would be useful at more moderate sulfide concentrations.

Microelectrodes with reasonable characteristics may be developed for nitrate, ammonia, and bicarbonate, but the present ion exchangers would limit such microelectrodes to use in environments with high concentrations and steep gradients. Electrodes for analysis of organic molecules, which are based on immobilized enzymes or bacteria, generally do not exhibit sufficient sensitivity to be used in marine environments.

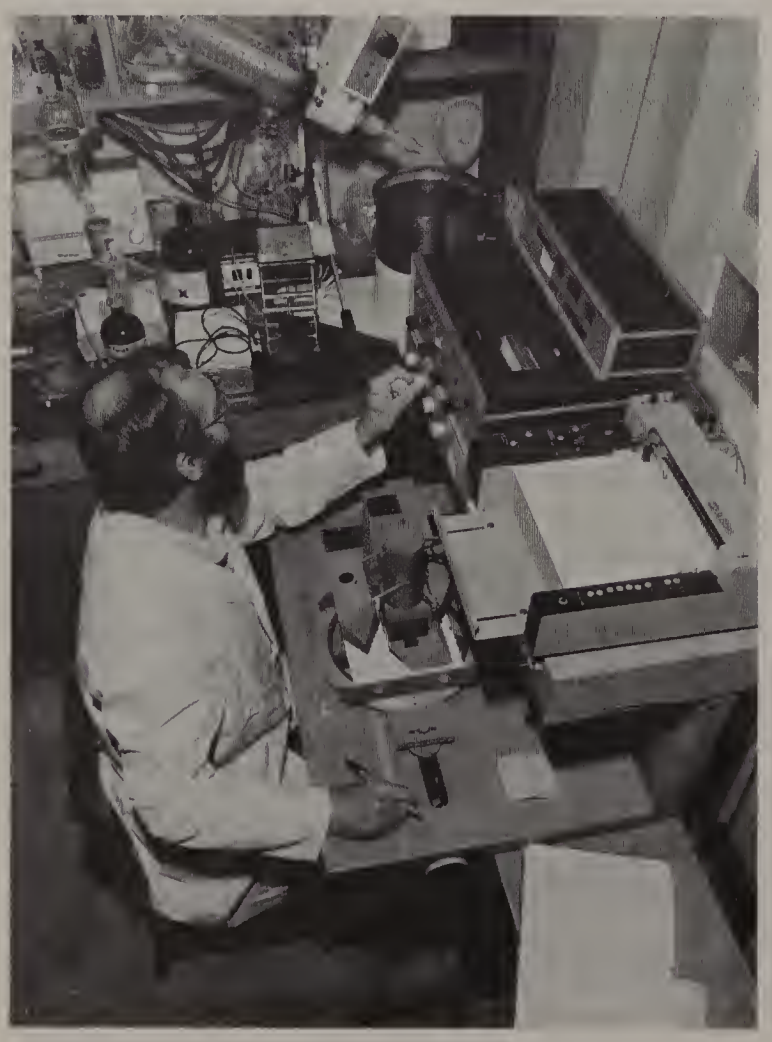
The most promising, yet largely unexplored methods for analysis of chemical species on a microscale, are *in situ* microcolorimetric analyses based on glass fibre optics. The recent development of suitable fibres, light detection systems, and computers, justifies a considerable effort to develop such analytical methods for use in environmental research. The optical detection may be preceded by chemical modification by immobilized enzymes or by purely chemical reaction with added reagents.

Methods to measure oxygen and pH by microcolorimetric methods based on glass fibre optics have already been developed, and methods for analysis of several other chemical species of interest for ocean sciences will probably be developed. The methodological problem presently limiting the number of chemical species to be detected is the lack of suitable (preferably reversible) chemical reactions which result in light absorbance and which can take place in a microchamber at the tip of a microfibre.

Niels Peter Revsbech
University of Aarhaus
Denmark

CHEMRAWN IV proceedings

The full proceedings of CHEMRAWN IV were published as a special issue of *Applied Geochemistry*, (Vol. 3, No. 1, January/February 1988). *Applied Geochemistry* is the Journal of the International Association of Geochemistry and Cosmochemistry.



A "flying-spot" scanning densitometer being used to quantify lipid samples on a thin layer chromagraph at the Plymouth Marine Laboratory.

Better health with chemistry — fact or fiction?

CHEMRAWN V

The fifth of the CHEMRAWN series of conferences was held in Heidelberg, FRG, 22–26 September 1986 (see pages 109 to 113 of the May 1987 issue of *CI*). Its title was "Current and Future Contributions of Chemistry To Health — The New Frontiers". The following article is the final chapter of *Contributions of Chemistry to Health*, Volume 1: Perspectives and Recommendations (see Box).

Introduction

The final, plenary panel discussion was conducted by and addressed to representatives of government, the World Health Organization, developing countries, pharmaceutical industry, universities and the press. It was chaired by the science journalist, Gero von Boehm.

Prof. Jan Thesing gave an introduction on behalf of IUPAC, GDCh (Gesellschaft Deutscher Chemiker) and the CHEMRAWN V committee. He reiterated that CHEMRAWN V had covered seven important areas of research highly relevant to health, and that its objectives were to define the state of the art, to describe new frontiers and perspectives, and to identify future needs in each area.

He emphasized the necessity of presenting the results of the conference in a broader framework allowing discussion not only of the scientific conclusions, but also of their political and social relevance. He invited the audience to participate in the panel discussion.

Summary of the panel discussion

We are living in a chemical era. Rapidly developing basic research continually presents new combinations of classical chemical processes and modern molecular biological methods.

The debate on the subject "Better health with chemistry" cannot be divorced from certain factors and assumptions. Both the social component of illness, the political and financial aspects of health and the question of feasibility must be discussed in order to assess objectively the expectations created by new research results.

The maintenance and improvement of health today is unthinkable without the contribution of the pharmaceutical industry and its research. However, progress in medical sciences is expensive and requires social acceptance. One conclusion is that pharmaceutical research in industry can only be financed through the price of marketed drugs. Politicians, universities and industry must cooperate to reconcile these factors.

Situation in the developing countries

In the countries of the Third World discontentment exists with the present trends in drug research. These countries regard their needs as being poorly represented. Of the drugs presently imported 80% are not essential in terms of the WHO essential drugs list, and new drugs in particular are too expensive. The main indications relevant for the developing countries are infectious and parasitic diseases. In spite of some positive examples, too little is being done in this direction. In 10–20 years' time perhaps a chance will exist for the countries of the Third World to establish an adequate, independent pharmaceutical production with the help of their scientists who have been able to acquire experience abroad.

The problem is, who will carry the costs for such projects? The WHO should encourage, support and coordinate contributions from the governments of

Heidelberg, venue of the CHEMRAWN V conference on "Contributions of chemistry to health".

The main indications relevant for the developing countries are infectious and parasitic diseases. In this photograph from Angola, "Sleep Brigades" of technicians use microscopes to examine blood and lymphatic gland fluid samples for trypanosomiasis — commonly known as sleeping sickness. (*Photo courtesy* WHO)

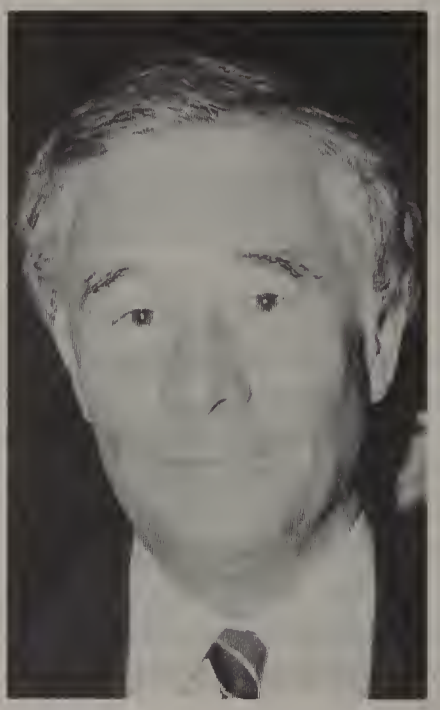
the developing countries. Progress in research on these special problems will also be possible when the health organizations and drug companies work together. In the developed countries research must be financed by profits made in the marketplace, which means that the present drug prices must cover the research costs for future success.

Financing and freedom of research and development

Ninety-five per cent of all drugs are developed by the research departments of pharmaceutical companies. This will remain the case in the future, under the assumption that the development costs can be recouped via the selling price of the drug. The present discussions on price reduction will result in the restriction of investment in research.

Since modern basic research is very expensive, this means that the high expectations of innovation will not be fulfilled. Professor Hans-Georg Gareis, responsible for pharmaceuticals and agricultural chemicals on the board of directors of Hoechst, stated: "It could happen that many possible paths opened up to us by basic research will remain impassable, since the research can no longer be financed. However, without sophisticated basic re-

CHEMRAWN V: Perspectives, recommendations and proceedings



Prof. H. Machleidt, Chairman, CHEMRAWN V Scientific Committee and editor of the conference proceedings and the perspectives and recommendations.

The full texts or abstracts of the invited lectures held during CHEMRAWN V are published in *Contributions of Chemistry to Health*, Volume 2. The 23 contributions in the book cover a wide range of topics and illustrate the indispensability of chemistry for the recognition and control of diseases.

The authors, internationally renowned experts in their fields, present the state of the art and analyse opportunities for further progress in the following areas: analytical chemistry as a prerequisite and stimulant for diagnosis and therapy; antibacterial and antiviral chemotherapy; cardiovascular diseases; metabolic disorders; neuropsychiatric diseases and cancer.

Volume 2 provides the data and references for the separately published Volume 1 "Perspectives and Recommendations" which contain the chairmen's summaries of the scientific sessions and a summary of the final panel discussion dealing with the interactions between science, the pharmaceutical industry, politics and society.

Contributions of Chemistry to Health, Volume 1: "Perspectives and Recommendations Compiled at the Fifth CHEMRAWN Conference, Heidelberg, 1986" is edited by H. Machleidt, H. Meyer, P. Tanswell and published by VCH Verlagsgesellschaft mbH, Weinheim, FRG, 1987. vii + 54 pp. ISBN 3 527 26717 4. Price DEM 28.00.

Contributions of Chemistry to Health, Volume 2: "Proceedings of the Fifth CHEMRAWN Conference" is edited by H. Machleidt and published by VCH Verlagsgesellschaft mbH, Weinheim, FRG, 1987. viii + 403 pp. ISBN 3 527 26618 6. Price DEM 145.00.

Work in industrial laboratories is not infrequently derived from basic principles established in universities.

search there will be no new and better drugs. Of course, industry can cooperate with universities and industrial research institutes, but in the last analysis this will not make the development of new drugs any cheaper."

In the context of high demands for innovation, the universities retain their established role as pioneers based on basic research. Work in industrial laboratories is not infrequently derived from basic principles established in university institutes. However, concepts for new strategies of drug treatment are now originating increasingly from the industrial research departments.

Cooperation between universities and industry arises quite naturally and embodies simultaneously a positive drive for success. In the Federal Republic of Germany and some other countries there is still a lack of "applications oriented" basic research, an optimal area for cooperation between universities and industry.

A prerequisite for cooperation is however that both sides maintain their independence. Since research results cannot be predetermined, no great danger is seen here for the freedom of science.

Another aspect of financing is the allocation of research funds. Due to dependence on the immediate marketplace, too much is being invested in "me too" research, in generics, and in research which does not lead to significant improvements.

A redistribution of resources into new areas is desirable. The courage of industry in pioneering innovations must be recognized and supported. The extension of patient lifetimes is an important contribution; in addition the discussion about animal experiments must be de-emotionalized.

The intelligent public must be better informed about decisions on which areas are really important for new drugs. There is a consensus that needs are present in all important medical indications and that the possibilities of finding new drugs have increased. There is a desire for more clarity in particular cases.

Risk assessment

If we wish to reply in the affirmative to the question "Better health with chemistry", the risks must also be assessed. At present there are no special research projects on the monitoring of risk.

Clemens Stroetmann, Vice President of the German Health Authority in Berlin, regarded the situation as follows: "The key point is to analyse the benefit for a particular indication in relation to the risk which we are prepared to accept, when we do not possess a better agent for fighting a particular type of disease. We will always have to take risks in this sense, because even in an optimal clinical trial the number of subjects is so small that at the time of registration the risk profile for a particular drug can only approximately be estimated. It is of decisive importance to observe whether this risk profile can be confirmed or requires modification in the years subsequent to the introduction of a drug to the market."

Drug side effects cannot be exactly substantiated by methods of scientific proof. The objective of present risk monitoring is not to prove that risks exist, but to prevent them.

The place of chemistry in public health

The positive successes of chemistry in contributing to the prolongation of life and to the reduction of morbidity have sometimes been presented in a distorted fashion.

Drugs will play an important role in the maintenance and regaining of health in the future. The potential which chemistry presents for drug development is by no means exhausted. Strengthened interdisciplinary cooperation will determine the status of research in the forthcoming decades and contribute to the solution of many problems.

"Too much concentration on the minimization of risks may endanger innovation. Exaggerated safety regulations and laws may hinder necessary developments. Regulations are however necessary, since science operates within a social environment. It is necessary here to avoid extremes and pursue an acceptable balanced course."

A central question concerns the evaluation of risks with new drugs. It is difficult to quantify these risks in advance. During drug development it is attempted to minimize the risk of adverse effects. More problems arise in risk prediction in the post-marketing phase, since many risks become apparent only during extensive use of the drug.

Too much concentration on the minimization of risks may endanger innovation. Exaggerated safety regulations and laws may hinder necessary developments. Regulations are however necessary, since science operates within a social environment. It is necessary here to avoid extremes and pursue an acceptable balanced course.

The suggestion that the dangers of chemistry could be avoided by using natural products is refuted by the fact that these are themselves chemicals and often not innocuous. Dr Sirait, General Director of the Ministry of Health in Indonesia, stated: "Nature is itself chemistry, and the development of chemistry is therefore not far removed from nature."

The role of chemistry in the future

Prof. Hans Georg Gareis agreed: "Biology is chemistry, and chemistry is biology. The classical chemist and the classical biologist will have to understand much more of each other in the future." A connecting link between these disciplines is already present — recombinant DNA technology. Its processes are of importance not only for the production of certain substances, but also as research tools.

The identification of a receptor, its isolation and purification now occupies an interesting area of molecular biology. "As soon as we know the code and can translate it into small molecules, classical chemistry in combination with biology today will open up hitherto unknown possibilities," is the opinion of the Director of the Pharmacological Institute at the University of Frankfurt, Professor E. Mutschler.

In the area of drugs the role of chemistry, regarded as part of the total effort towards progress in therapy, is not yet fully exploited. Technical progress makes chemistry more sensitive and specific. Arising from the key function of genetic engineering, good prospects are also apparent for classical chemistry.

Conclusion

Better health with chemistry, combined with the proper environment, pharmacological strategies and social responsibility, is a fact, not fiction.

Advanced technology materials for innovations in communication, energy and transportation

Prof. C. N. R. Rao

CHEMRAWN VI

Prof. "Ram" Rao reviews advanced technology materials required in communication, energy and transportation sectors and indicates the role of chemistry in illustrated cases. He also points to the problems of developing countries. The paper was presented as a plenary lecture at CHEMRAWN VI (see November 1987 issue of *CI*) and appears in the "Perspectives and Recommendations" of the conference.

Introduction

Advanced technology materials have made a tremendous impact on the quality of life of man. The prosperity of a country is almost directly related to the magnitude of use of these materials. In fact, we can employ the usage of advanced technology materials as an index of development; clearly, this index distinguishes the developed from the developing countries. The investment on materials industries in advanced countries in the last few years has been stupendous, the turnover of certain materials reaching astronomical proportions.

The fastest growing industry today and probably the most demanding one as well, is that related to materials. Unfortunately, advanced materials have not entered the markets of developing countries and most of them have little or no industrial effort in this direction, let alone research and development. Yet, the same materials that have been responsible for the progress made in advanced countries are required to improve the quality of life in the poorest of the developing countries. After all, better transportation, communication and energy alternatives are the crying needs in almost all developing countries.

While talking of developing countries, one has to remember the different categories amongst them. There are small developing countries which are economically rich and there are some others which are very poor. There are large developing countries which are economically backward and some of them are overpopulated. Very few of the developing countries have adequate infrastructure for science and technology and the only way in which they can ever get to see the impact of modern materials is by importing them. If the countries are

sufficiently small, this would probably be the only option. However, in large developing countries where the requirements are also large, economic conditions may not permit wholesale import of all that is required to improve the quality of life. Such countries would therefore have consciously to develop a strategy for ushering in a culture of advanced technology materials directed to solving the problems of the common man.

The case of India is unique since it has adequate infrastructure for science and technology, although it is a poor, overpopulated country. India is now facing the dilemma in what type of strategy it should adopt to solve pressing problems of mankind through the application of science and technology. As in most other countries, the three key sectors for development are communications, transportation and energy. These provide the basic foundation on which science and technology must be built. Transport and communications play a key role in achieving social integration which is crucial. These three key sectors are not to be seen as problems, but as opportunities.

"By no means should the developing countries be denied the benefits of R&D in these crucial areas, since many of them cannot directly contribute to or afford new developments because of the poor infrastructure for science and technology. Advanced countries should take this as an opportunity not only in science and technology but also to serve mankind."

Materials required for communication, energy and transportation pose interesting challenges in R&D and call for considerable investment. And in developing such materials, chemists have much to offer. Solid state chemistry is concerned with the synthesis, structure, properties and design of tailor-made solids. In this article, I shall briefly deal with the advanced materials required in the three sectors and indicate the relevance of chemical science in some illustrative cases.

A review of some classes of materials

Composites

Polymers have undoubtedly revolutionized our life style. The per capita consumption of plastics is an index of "development". In the world today, the average per capita consumption is 11 kg (compared to a developing country like India where it is less than 1 kg). Composites made of plastics or reinforced plastics (FRP) are used widely. In the US, composites are used in transport and aerospace

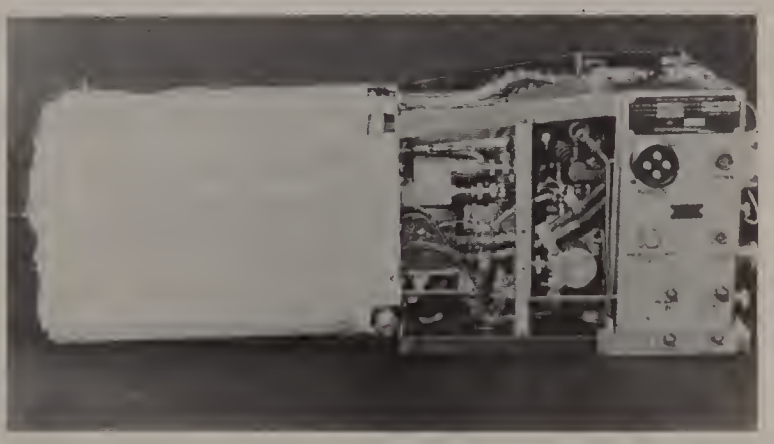
The body of this prototype ocean cruiser is made entirely from carbon-fibre-reinforced plastics (CFRP). The composite polymers are stronger than steel but lighter than aluminium. (*Photo courtesy SRI-Asia*)

applications to the tune of 26% (compared to 5% in India). FRP is used to the tune of 850,000 tons per year in the US and 300,000 tons in Japan (compared to 6000 tons in India). The use of FRP in automobiles and other transportation is well known.

High-performance composites made by using strong fibres (C, B or aramid) are important new structural materials for aircraft and space industry. It is possible that future aircraft will use more than 50% of these composites. Automobiles are likely to use these materials in the future. The p-aramid (Kevlar) fibres (40% lower in density than fibreglass) have already made a great impact in aircraft industry. Carbon–carbon composites have shown satisfying results and increased potentialities.

Energy materials

Our main energy sources have been hydroelectric, thermal and atomic. In countries like India solar energy is available in plenty and throughout the



This fuel cell, used in the Space Shuttle orbiter, is capable of generating 12 kilowatts at peak and 7 kilowatts average power. (*Photo courtesy NASA*)

CHEMRAWN VI publications

Invited papers and posters

A limited number of copies of a volume containing the invited papers and poster presentations at the CHEMRAWN VI World Conference on Advanced Materials for Innovations in Energy, Transportation & Communications is available from the IUPAC Secretariat in Oxford.

The 66 invited lectures published in this volume are grouped under the following headings:

- Energy generation and materials
- Energy conversion, storage and materials
- Key materials for future energy systems
- Space and materials
- Aeronautics and materials
- Surface transportation and materials
- Materials for transportation
- Key technologies in electronics
- Microelectronics
- Optoelectronics
- Peripherals
- New materials for electronics.

Posters are grouped as follows:

- Semiconductors
- Processing and packaging materials
- Optoelectronics and peripherals
- Superconductors
- Conductive polymers and graphite
- Composite materials
- Ceramics and metals
- Energy functional materials
- Organic and polymeric materials.

Copies of CHEMRAWN VI Invited Papers & Poster Presentations, *price GBP 13.50 or USD 25.00 (including postage and packing) are available from the Information Officer, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK.*

Perspectives and recommendations

These are published as a separate 141-page volume. The contents include:

- The activity and role of CHEMRAWN (preface by Bryant Rossiter)
- General recommendations
- Perspectives — advanced materials for innovations
  I. Energy
  II. Transportation
  III. Communications and information

Sir George Porter at CHEMRAWN VI in Tokyo. He presented a plenary lecture on "Energy materials and human life".

  1. Ceramics
  2. Metals
  3. Semiconductors
  4. Organics and polymers
  5. Composites
- Opening addresses
- Plenary lectures:
  — Energy materials and human life, George Porter
  — Advanced materials and technological innovation, R. C. Forney
  — Advanced technology materials for innovations in communication, energy and transportation: challenges in chemistry and problems of developing countries, C. N. R. Rao
  — European approach to advanced materials for innovations, K. H. Büchel
  — The development of rare earth research for advanced materials in Beijing University, Guang-Xian Xu
  — The outlook for information and communications technology and its impact on human society, Tadahiro Sekimoto.

Copies of CHEMRAWN VI Perspectives and Recommendations, *price USD 25.00 (including postage, surface mail) — personal cheques not accepted (bank drafts are), may be ordered from The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.*

year. The importance of making materials for solar energy conversion is therefore obvious. Two means of beneficiating solar energy are photovoltaic or photoelectrochemical. For photovoltaic applications, silicon still remains the most viable material (see section on electronic materials). GaAs and CdS are solar cell materials with special applications. For photoelectrochemical cells, several oxide and chalcogenide semiconductors have been studied. An economical means of producing H_2 by this route is still not available. Electrochemical photovoltaic cells hold some promise.

Fuel cells (H_2 or CH_3OH) continue to be attractive as energy packages. Stabilized zirconia is a good oxygen solid electrolyte. We have to find a good proton conductor for CH_3OH fuel cells.

Hydrogen storage materials (when H_2 becomes available in plenty) have been studied extensively. FeTi and $LaNi_5$ are two of the materials studied for the purpose.

Batteries (or electrochemical cells) of various kinds have been produced or are being investigated. The most viable ones are still the lead–acid and Ni–Cd batteries. For electric vehicles, the various possibilities are, PbO_2/Pb, O_2/Zn, O_2/Fe, NiOOH/Fe and NiOOH/Zn. Miniaturized batteries (Ag-button or lithium for example) are being made; lithium intercalation in layered materials (V_6O_{13} or TiS_2) has proved to be effective for Li batteries. Intercalation chemistry has indeed become a major area of study in solid state chemistry. Reversible electrochemical doping of polyacetylene enables fabrication of a rechargeable battery.

Electronic materials

Crystalline silicon has formed the backbone of much of semiconductor electronics. Its applications in computers and various devices are well known. Silicon is the only viable material to date available for photovoltaic energy conversion. Amorphous silicon, specially that doped with group III or V elements, seems to be on the threshold of becoming a good alternative for photovoltaic and other applications. By employing heterojunction structures with layers of amorphous SiC, over 10% efficiency has been achieved in large area structures.

A number of II–VI and III–V semiconductors are used in electronic industry. Special mention must be made of GaAs and Al-doped GaAs which give high photovoltaic efficiencies (>20%). GaAs doped with III and V group elements are good light emitting diodes for optical communication (e.g. $GaAs_{1-x}P_x$). GaS itself can be made by CVD ($AsCl_3$ + Ga) or by the reaction of AsH_3 with Ga and HCl. Hydrides of group V elements reacting with an organometallic such as $Ga(CH_3)_3$ is another method.

Superconductors

High-temperature superconductivity has been a dream of all scientists. This area has suddenly become promising because of the discovery of certain oxides of copper which show superconductivity above liquid N_2 temperature. To start with, it had been found that oxides of the type $La_{2-x}Sr_x(Ba_x)CuO_4$ possessing the K_2NiF_4 structure show superconductivity in the region 30–40 K. However, the new Y–Ba–Cu oxides exhibit superconductivity above liquid nitrogen temperature; these oxides seem to be related to the perovskite structure.

There is no doubt that strategies will be developed to produce novel oxides and other materials exhibiting superconductivity at still higher temperatures (possibly at room temperatures). Undoubtedly, solid state chemists will have much to contribute to engineer such materials. Once superconductivity is found to occur at reasonable temperatures, levitation transportation would become practical. Power transmission and development of magnets (for MHD generation) would then be greatly revolutionized.

Ferroics

There is a class of materials called the "ferroics" which are materials possessing two or more orientation states or domains which can be switched from one to another through the application of one or more appropriate forces. These materials include ferroelectric and ferroelastic substances as well. Some of these (e.g. $LiNbO_3$) are important optoelectronic materials. Colour modulation and optical switching are facilitated by ferroelastic materials (e.g. GMo). Greater studies of ferroics are called for.

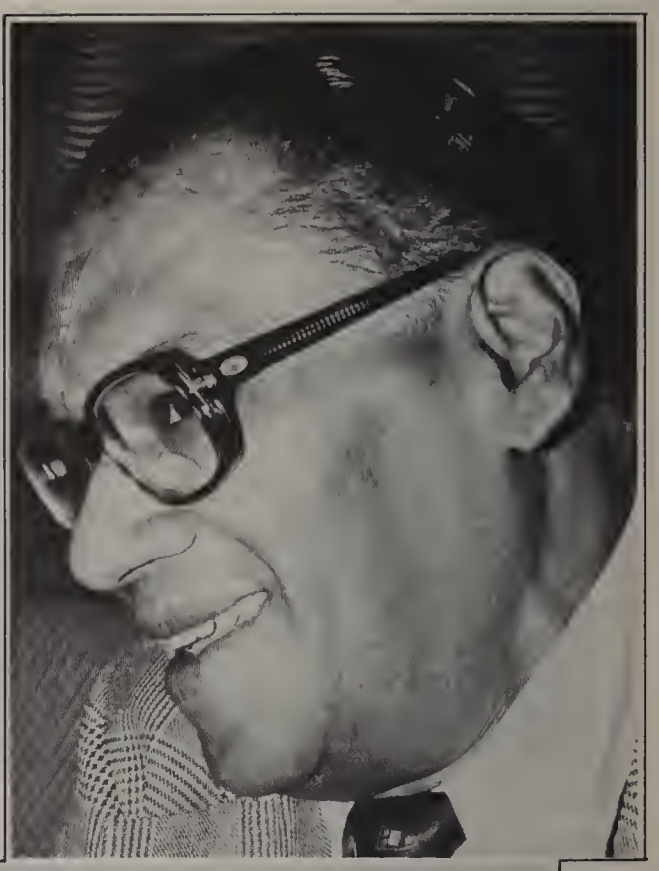
There is quite a likelihood that electronics will be replaced, at least partly, by photonics in the not too distant future. Replacement of the electron by the photon has tremendous consequences. Materials development for photonics is an area of great importance. It is noteworthy that methods of synthesis of some of these materials are crucial. Use of organic derivatives as precursors (e.g. oxalates, citrates etc. for the synthesis of PZT and PLZT or even $BaTiO_3$) is an example. Photonics will have a great impact on the future of computers, communications and laser technologies.

Fibres

Fibre communication has revolutionized modern communication practice. Generally, pure silica fibre is used for the purpose (140 megabits per sec over 30 km distance without use of repeaters). Fibres made of heavy metal fluorides are now attracting considerable attention. For preparing high-purity silica, the sol–gel route is used with hydrolysable organic derivatives such as tetraethoxysilane.

The light sources used in fibre communication are generally Ga–As type III–V semiconductors

Four IUPAC Presidents at CHEMRAWN VI



Past-President Prof. C. N. R. Rao who presented a plenary lecture at CHEMRAWN VI entitled "Advanced technology materials for innovations in communication, energy and transportation: challenges in chemistry and problems of developing countries".

Prof. Sabura Nagakura, Chairperson of the CHEMRAWN VI Organizing Committee and IUPAC President 1981–1983.

Prof. Valentin Koptyug (left) and Dr. Bill Schneider (right) at a meeting of the CHEMRAWN Future Actions Committee in Tokyo. Koptyug is the current President of Union. Schneider was President 1983–1985.

(e.g. $Al_xGa_{1-x}As$, $Ga_xIn_{1-x}As_yP_{1-y}$); a variety of such laser materials is available for different types of applications.

Magnetic materials

Chemists contributed much to the development of samarium-cobalt and related magnetic alloys. Traditionally, ferrite materials have been widely employed in the communication industry. In Japan and the US alone hard and soft ferrites are used to the tune of $600 million a year. The newest of the magnetic materials are Fe–Ni–B based amorphous alloys with high permeability, low magnetostriction and high mechanical hardness. The Fe–Nd–B system is the most powerful magnet known hitherto. These as well as the new superconducting materials will undoubtedly usher in a new era in the world of magnetic materials.

Ceramics

Other than the ferrites referred to earlier, a number of advanced ceramic materials are gaining increasing importance. Structural ceramics required for engine systems require high strength, low thermal conductivity, high thermal shock resistance, chemical inertness and other properties. Silicon nitride, Si_3N_4, has turned out to be a good material for high-temperature applications; this can be made

by many routes including CVD and reaction bonding. Sialon obtained by ingenious chemical substitution of Si and N by Al and O, respectively is another such material; several modified sialons have also been studied.

Toughened zirconia ceramics are used for thermal insulation in turbines etc. because of its low and constant thermal conductivity. Transformation toughened zirconia has also found useful applications. Some of the sensor materials (e.g. stabilizer zirconia is an oxygen sensor) also employ certain ceramic materials, mainly oxidic.

Sectorial priorities

In the three key sectors of communication, energy and transportation, almost everything seems to be of high priority. The relative priorities of materials would vary from country to country depending on the state of development. There are, however, some materials which are of immense importance universally, typical of them are the following:

- Communication: fibres, ferrites
- Energy: solar energy materials (photovoltaic, PEC etc.), batteries, fuel cells
- Transportation: composites (FRP etc).

Research, development and success related to the above would benefit all the countries, including the developing ones.

There are some materials where R&D as well as applications will be possible in the near future only in countries with considerable infrastructure in science and technology. Typical examples of such materials are:

- Superconductors: for power transmission, magnets and transportation
- Advanced ceramics: for turbines and transportation
- High performance composites: automobiles, aircraft and space applications
- Optoelectronic materials: photonics

Even in these areas, once the technology becomes feasible, there will be widespread use everywhere, possibly with a small time gap between the advanced and the developing countries.

I believe that advanced materials is one area where the benefits of R&D will eventually reach all of mankind, although the research effort itself will be concentrated in a few countries advanced in science and technology. Each developing country will

Solar energy laboratory at Dakar University, Senegal: "better transportation, communication and energy alternatives are the crying needs in almost all developing countries." (*Photo courtesy UNESCO*)

have to decide on its strategy depending on its size, status in science and technology, available natural resources and national priorities. For a developing country like India, however, there is no choice but getting into R&D in selected areas of greater national relevance, while making a judicious choice of technologies which have to be borrowed or bought. Joint collaborative efforts between countries in materials R&D provide immense opportunities and bear much promise. Since most developing countries cannot afford to bear the cost of development of new materials, we should see how best they can also derive benefits from the developments made elsewhere; this is a human problem and a social responsibility of scientists.

Conclusions

Advanced technology materials in communication, energy and transportation sectors provide many challenges to chemists and I have covered some aspects which are illustrative rather than comprehensive. Considerable research and development efforts will have to be made by chemists in these areas; chemists have much to contribute by virtue of their unique talents in synthesis and designing materials based on an understanding of structure–property relations. Synthesis of novel materials as well as newer methods of synthesis would alone offer chemists sufficient opportunities as illustrated by the sensational discovery of oxidic high-temperature superconductors. Characterization of materials involving newer and better techniques also offers considerable scope to chemists.

Attempts should be made to see that the results of new innovations in materials related to the three

key sectors benefit mankind as a whole. It may be necessary to forge efforts directed towards solving some of the pressing problems facing the developing world. By no means should the developing countries be denied the benefits of R&D in these crucial areas, since many of them cannot directly contribute to or afford new developments because of the poor infrastructure for science and technology. Advanced countries should take this as an opportunity not only in science and technology but also to serve mankind.

Acknowledgment
The author thanks the University Grants Commission and the Department of Science and Technology for support of his research in the area of solid state chemistry.

Publications

Silicon in living systems

The Earth's crust contains 27.8% silicon. More than half of this silicon occurs as oxygen compounds: silica and silicates.

Silicon is present in small quantities in nearly all living organisms and materials of natural or artificial origin. Silicon compounds are consumed by humans when they drink water (which always contains soluble silicon compounds), when they inhale air (which contains fine particles of silicon-containing dust) and finally when they eat.

The daily human uptake of silicon by eating food — especially vegetables — is about 0.5 g.

Silicon in mammals

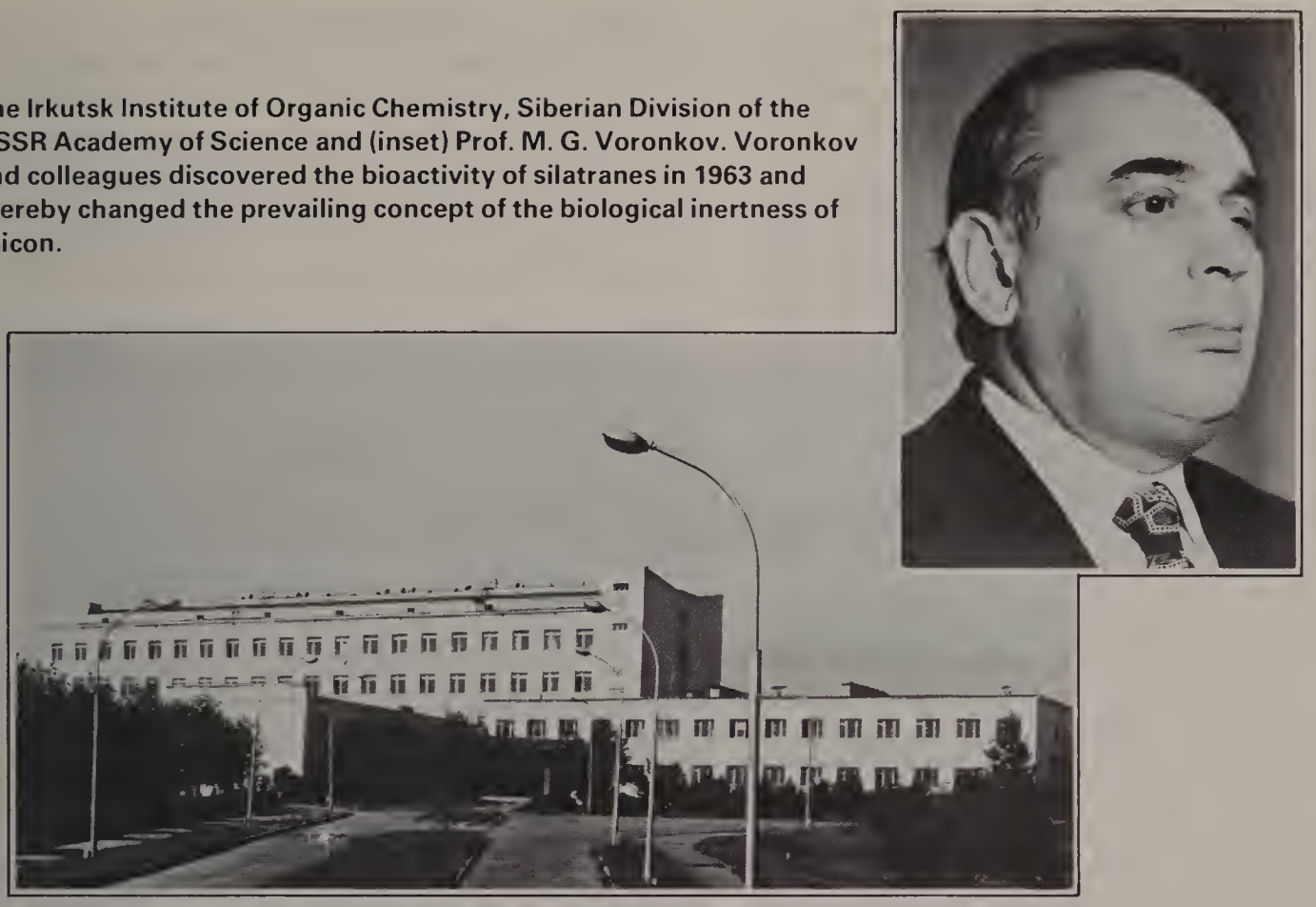
The daily human uptake of silicon by eating food — especially vegetables — is about 0.5 g. Much greater quantities of the element are consumed by herbivorous animals. However, silicon does not seem to accumulate in mammals — the silicon content of the human body is several grams — and usually does not produce either adverse or beneficial effects. The one exception is silicosis, lung disease, caused by chronic inhalation of comparatively coarse particles of silica.

For these reasons, scientists believed until about three decades ago that silicon compounds were biologically inert, useless and even harmless. The presence of silicon in mammals was considered occasional and non-essential. The idea widely accepted at that time, that silicon is of no importance in living systems, has contributed much to the introduction into medicine and cosmetology of organosilicon polymers: polyorganosiloxanes (silicones).

At present, polyorganosiloxanes are extensively used in plastic and restorative surgery. This is due, first of all, to the fact that they are soft implant materials which do not produce any hazardous effects and do not undergo decomposition in the organism. The stability of these compounds to ageing and sterilization as well as their high adhesive properties and minimal tissue response make them promising for medical use (prosthetic devices, heart valves, artificial arteries, bone substitutes, etc). Silicones have also found applications as a "depot" for therapeutic preparations such as drugs of prolonged action.

Discovery of organosilicon bioactivity

The discovery of bioactivity of organosilicon compounds, silatranes, $RSi(OCH_2CH_2)_3N$ made by Voronkov and colleagues (Institute of Organic Chemistry, Siberian Division, Academy of



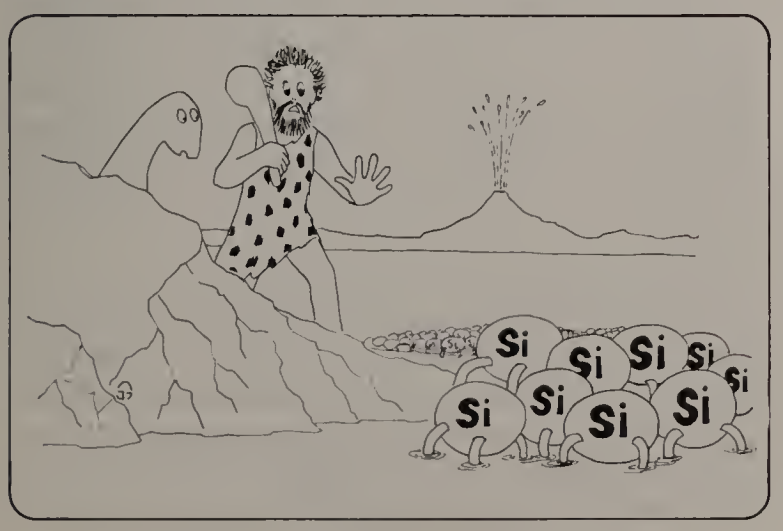
The Irkutsk Institute of Organic Chemistry, Siberian Division of the USSR Academy of Science and (inset) Prof. M. G. Voronkov. Voronkov and colleagues discovered the bioactivity of silatranes in 1963 and thereby changed the prevailing concept of the biological inertness of silicon.

Sciences, Irkutsk, USSR) in 1963 changed the prevailing concept of the biological inertness of silicon. In particular, the 1-arylsilatranes proved to be highly toxic for warm-blooded animals and exerted a stimulating effect on the central nervous system.

The clearly displayed physiological effects of silatranes have convinced Voronkov and co-workers that many other silicon derivatives possess specific bioactivity and that a number of derivatives of this element should play a significant role in certain vital processes.

Silicon in nucleic acids

Natural silicon compounds played an essential part in the origin of life on earth. Since they possess a specific structure and exhibit adsorption properties, they served as a matrix on which simple organic molecules from the oceans were transformed to complex nucleotides and nucleic acids and proteins.



In addition, optically active forms of quartz ensured the appearance of asymmetric naturally occurring organic compounds. In the course of biogenesis on the surface of silica, silicates and alumosilicates (initially clays), silicon could not but insert in the organic structures formed. In that remote epoch, silicon was one of the principal elements in living nature and its proto-organisms. This is confirmed by the fact that nowadays silicon is of great importance for numerous organisms left at the early stages of evolution and occurs there in large quantities.

Numerous representatives of lower lifeforms inhabiting oceans, seas and lakes — indeed the bulk of phytoplankton and zooplankton — take up silica from the external aqueous environment and use it for the formation of their shells, frustules and frameworks. These are simple organisms such as diatoms, foraminifera, radiolaria, siliceous sponges and so on.

Silicon still occurs widely in "prehistoric" plants such as horsetail, moss and ferns. "Silicate bacteria" are known to break up rocks by liberating potassium, phosphorus, silicon and some trace elements from minerals.

Voronkov has established that silicon is an inherent component of nucleic acids: content is 0.15 to 0.30%. The silicon is assumed to be isomorphous to phosphorus and able to substitute some phosphorus atoms.

Recently Soviet scientists N. E. and E. P. Aleshin and E. R. Avakyan have provided evidence for the essential role of silicon in the functioning of nucleic acids. They have found that rice possesses a "fermentative" system which uses both phosphorus and silicon for the formation of nucleic acids.

Silicon compounds also play an important part in the life of organisms at a higher stage of evolutionary development. These include, for example, higher cultivated plants (wheat, oats, barley, millet, rice, sugar beet, etc), bamboo and some trees (fir, larch, palm). These and other plants with comparatively high silicon contents intensively assimilate silicon from soil.

The role of silicon in the life of plants is not well understood. However, it is well known that silicon is present in plant tissue, partly as organosilicon compounds (silicic esters of hydrocarbons and proteins), and partly as mineral silicon compounds (silica, silicic acids and silicates). Certain enzymes known as silicases have been found in plants. These facilitate the conversion of inorganic compounds of silicon to organosilicon derivatives.

The importance of silicon in the growth and development of birds and mammals has been confirmed by E. M. Carlisle and K. Schwartz. They observed drastic changes in the skeletons, feathers, skins and weights of chicks and rats fed on a silicon deficient diet. They were kept in plastic chambers completely preventing the penetration of environmental silicon.

Silicon chemistry

The above discussion is based on part of a paper by M. G. Voronkov presented at the 8th International Symposium on Organosilicon Chemistry, St Louis, Missouri, USA, 7–12 June, 1987. Invited and special lectures from the symposium are published in *Silicon Chemistry*.

The book introduces the important industrial uses of organosilicon chemistry including the application of silicon as an agent for the alloying and de-oxidizing of metals, the production of silanes and organo-metallic compounds, and its uses as a semiconductor. The chapters are grouped into nine sections:

1. Silicon-assisted organic synthesis
2. Organic chemistry of silicon
3. Silicon in living systems
4. Silicon reactive intermediates
5. Silicon–silicon chemistry
6. Silicon–oxygen polymers and materials
7. Inorganic chemistry of silicon
8. Silicon in solid state technology
9. Physical chemistry, theoretical studies and spectroscopy.

Silicon Chemistry *is edited by J. Y. Corey, E. R. Corey and P. P. Gaspar and published by Ellis Horwood Limited, Chichester, UK, 1988. xiii + 563 pp. ISBN 0 7458 0528 0. Price GBP 60.00.*

Publication of *IUPAC Handbook 1987–89*

The *IUPAC Handbook 1987–89* has now been published. The handbook contains not only the membership of standing committees, divisions, commissions and so on, with the full address of each member, but also the projects on which the IUPAC bodies are working.

The statutes and bylaws of the Union and the rules and terms of reference of the divisions/commissions are reproduced in full. The minutes of the biennial council meeting are also included.

The handbook is intended to provide detailed information on the membership, working programmes of the Union, and rules of operation. A limited number of copies of the book are offered at a substantial discount to affiliates and members of IUPAC commissions and committees.

IUPAC Handbook 1987–89 *was published by Blackwell Scientific Publications Ltd, Osney Mead, Oxford OX2 0EL, UK, August 1988. 287 pp. ISBN 0 632 02383 X. Full price GBP 25.00/USD 32.00. Discounted price for affiliates and IUPAC commission and committee members GBP 12.50/USD 16.00.*

Pesticide metabolism

One of the most difficult areas of toxicology is the extrapolation to man of results obtained with experimental animals. The common occurrence of species differences in a number of biological processes confounds such extrapolation.

The metabolism of pesticides, drugs and other foreign compounds is a very important determinant of their toxicological effects. An understanding of species differences in metabolism and the ability to predict or to study directly the metabolic fate of a pesticide in man, therefore, are of great value in the validation of animal models for man.

When chemicals foreign to mammals enter the body they may undergo one or more of the following three fates: they may remain unchanged, break down spontaneously or undergo enzymatic metabolism. Of these, enzymatic metabolism (biotransformation) is by far the most frequently encountered fate. R. T. Williams proposed that

metabolic reactions generally occur sequentially, a compound initially undergoing a phase I reaction of oxidation, reduction or hydrolysis, which serves to introduce a functional group into the molecule. This functional group then serves as the site for biosynthetic phase II reactions, in which an endogenous moiety is added to the foreign compound or its phase I metabolites. Thus, foreign compounds undergo four types of metabolic reactions: (1) no structural modification, (2) phase I metabolism, (3) phase II metabolism and (4) a combination of phase I and phase II metabolism.

In the biotransformation of foreign compounds such as drugs, pesticides and industrial chemicals in mammals, very marked species differences are well documented. This is not surprising in view of the great diversity of species even within the order Mammalia.

The ultimate objective of metabolic studies on foreign compounds is to provide chemical and biochemical perspective to toxicological and pharmacodynamic studies in experimental animals which are serving as models for man. Many comparative metabolism studies of drugs in mammals including man have been carried out mainly for the purposes of assessing their toxicological features as well as estimating duration of drug action from the viewpoint of therapy. Metabolism studies of non-therapeutic compounds such as pesticides and industrial chemicals have, however, been performed generally using only laboratory animals such as rats, mice and dogs. Studies in humans have been carried out relatively rarely owing to ethical problems. However, any available information on man is eagerly received, because of its obvious importance to the basic understanding of the toxicology of the compounds.

Nowadays various mammalian toxicology data are required in many countries in the world for the registration and safe use of chemicals including pesticides and regulation is becoming more stringent, requiring increasingly sophisticated data. Ideally all toxicological information should be obtained in an animal species that responds to the chemical in question equally to or similarly to humans. One major governing factor determining the response (or susceptibility) of an animal species to a chemical is the behaviour (metabolic fate) of the compound in the animal body. This implies that, to obtain toxicologically meaningful animal data applicable to humans, the animal species used should be one whose metabolic patterns of the test compound are similar to those in humans. The metabolism of foreign compounds in man, however, cannot be presumed on the basis of the results from laboratory animals owing to the frequently encountered species differences. Thus, it is of the utmost importance to elucidate species differences and the factors affecting them and to try to predict the human metabolism by extrapolation of data on laboratory animals to man in the light of experience of these differences.

Pesticide Metabolism: Extrapolation from Animals to Man is concerned with the factors affecting species differences in the metabolism of foreign compounds in experiment animals and

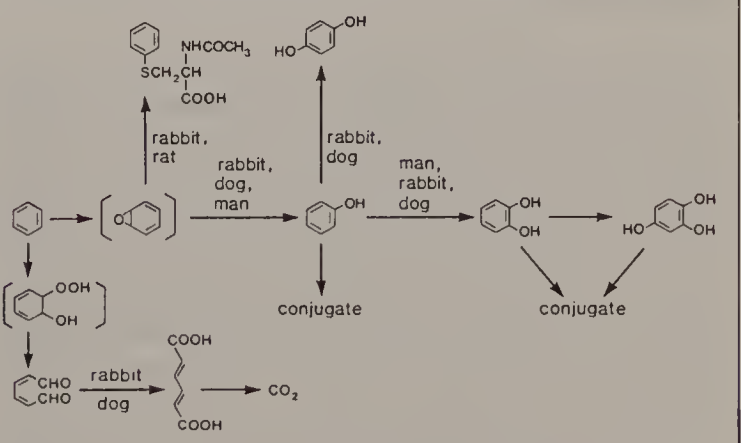
Metabolic pathway of benzene in mammals

Benzene is a common laboratory and industrial chemical which produces a unique spectrum of acute and chronic toxic effects in man.

Benzene is oxidized to phenols, namely, phenol, quinol, catechol and hydroxyquinol in the rabbit and dog. Phenol is the main metabolite and accounts for about one-quarter to two-fifths of the dose in rabbits. Quinol and catechol account for about 7% of the dose. Hydroxyquinol is a very minor metabolite, accounting for less than 1% of the dose. The formed phenols were excreted mainly in the conjugated form (glucuronide and sulphate). However, there are species differences in the conjugation patterns of phenols.

Trans,trans-muconic acid is formed in dogs and rabbits dosed with benzene. The amounts of this metabolite have been reported as being from 0.1 to 4% of the dose. 1-Phenylmercapturic acid is a minor metabolite of benzene up to 0.37% of the dose in rats. Also, this metabolite is found in rabbits and is excreted in amounts up to 1% of the dose. Via benzene oxide it is apparently formed directly from benzene, presumably since it has been shown using ^{14}C-phenol that it is not a metabolite of phenol.

A major proportion (51 to 87%) of benzene inhaled by man was excreted in the urine as phenol; minor products were catechol and hydroquinone. These phenols were excreted largely as conjugates. The fate of benzene is illustrated in Fig. 6.1 on p. 78 of *Pesticide Metabolism: Extrapolation from Animals to Man*:



man. As examples, biotransformation of pesticides, drugs and industrial compounds in mammals including man are dealt with, summarizing findings in the open literature. Based on this information the review intends to assess the similarity of animal species to man in the metabolism of pesticides. Later chapters are concerned with techniques and problems associated with the study of the fate of pesticides in man. In the final chapter a general approach to the execution of human metabolism studies is proposed.

There are 12 chapters:

1. Introduction
2. Factors involved in species differences in metabolism
3. Metabolism of pesticides
4. Metabolism of drugs
5. Metabolism of food additives
6. Metabolism of industrial chemicals
7. Some factors affecting metabolism in man
8. The study of metabolism using *in vitro* techniques
9. The extrapolation to man of results in animals
10. Use of stable isotopes in metabolism studies
11. Ethical considerations in human metabolism studies
12. Conclusions and recommendations.

Pesticide Metabolism: Extrapolation from Animals to Man by J. Miyamoto, H. Kaneko, D. H. Hutson, H. O. Esser, S. Gorbach and E. Dorn is published by Blackwell Scientific Publications Ltd, Oxford, UK, 1988. viii + 120 pp. ISBN 0 632 02256 6. Price USD 22.50/GBP 12.50.

IUPAC nomenclature in chemical dictionaries

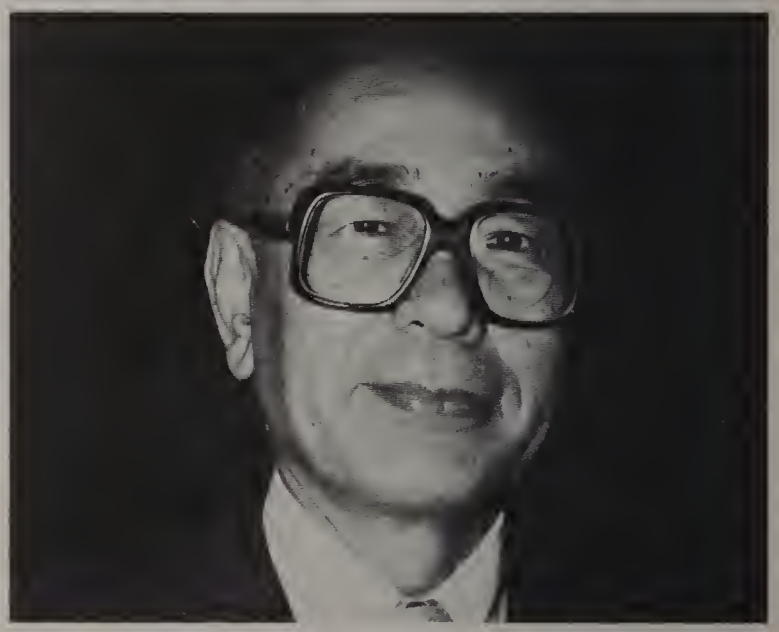
Grant & Hackh's *Chemical Dictionary* (5th Edn, McGraw-Hill, 1987. ISBN 0 07 024067 1, price GBP 74.00) contains more than 55 000 generic and trade names using IUPAC and CAS (Chemical Abstracts Service) nomenclature. The IUPAC nomenclature is drawn from *Nomenclature of Organic Chemistry* (the "Blue Book"), IUPAC, Pergamon Press, Oxford, 1979 and *Nomenclature of Inorganic Chemistry* (the "Red Book"), IUPAC, Butterworth, London, 1970.

Römpps Chemie Lexicon: Band 5: Pl-S (German Edn: Franckh'sche Verlagschandlung, Stuttgart, FRG, 1987. ISBN 3 440 045102, price GBP 50.00) by Otto-Albrecht Neumüller similarly draws extensively on IUPAC nomenclature.

There is little mention of IUPAC nomenclature in Hawley's *Condensed Chemical Dictionary* (11th Edn, Van Nostrand Reinhold, New York, 1987. ISBN 0 442 28097 1, price GBP 39.95) revised by N. Irving Sax and Richard J. Lewis, Sr although there is an entry which explains that IUPAC is the International Union of Pure and Applied Chemistry. However this dictionary does have a periodic table of the elements with the "new notation" labelling groups from 1 to 18 as well as the "previous IUPAC form" (A's and B's) and the CAS version (B's and A's).

Cationic polymerization

The 8th International Symposium on Cationic Polymerization and Related Processes, sponsored by



Macromolecular Division President Professor Takeo Saegusa who lectured on "A new conceptualization in relation to ionic polymerization" at the 8th International Symposium on Cationic Polymerization and Related Processes held in Munich, August 1987.

IUPAC and GDCh (German Chemical Society), was held 10–14 August 1987 at the Technical University of Munich, FRG. It was attended by about 160 scientists from many countries.

The scientific programme was divided into eight major topics:

1. Fundamental carbenium ion chemistry
2. Ring-opening polymerization
3. Cationic polymerization mechanism
4. Cationic olefin polymerization
5. High energy induced processes
6. Industrial applications of cationic polymerization
7. Telechelics, macromonomers, and block and graft copolymers
8. Non-carbon polymers via cationic polymerization

The first group of lectures illustrated the close association between fundamental organic chemistry and polymer science. Some of the world's leading experts on carbenium ion chemistry accepted the invitation to attend the conference.

New developments in the field of cationic vinyl polymerization were presented both by scientists

relatively new to this field and by workers active in this area for many years. Advances achieved with the aid of modern analytical tools in traditional areas such as the kinetics and mechanism of initiation, chain growth, transfer and termination, and also new results in the syntheses of telechelics, macromonomers, and "tailor-made" polymers were presented. Particularly exciting were developments of living polymerizations of vinyl ethers and of methylpropene.

Only one year after the Ring-Opening Symposium in Blois (France), only few new results might have been expected at a symposium on this topic. The wealth of material presented testified to the rapid growth of knowledge in this area. Among the most interesting and stimulating presentations were those concerning light-induced cationic polymerizations.

The invited lectures from the 8th International Symposium on Cationic Polymerization and Related Processes are published in Volume 13/14 of Makromol. Chem., Macromol. Symp. *(1988).*

Chemistry for our new world

Prof. L. Paoloni and "friend" at an exhibition at the IUPAC Congress in Manchester, UK in September 1985. Paoloni lectured on the use of atomic orbitals at the 9th ICCE held in Brazil, July 1987.

The December 1987 issue of *International Newsletter on Chemical Education* is devoted to the 9th International Conference on Chemical Education (ICCE) held at the University of São Paulo, Brazil in July 1987. The theme of the conference was "Chemistry for our new world". A report from the organizing committee is followed by summaries of the plenary lectures:

- The Brazilian National Alcohol Programme (W. Borzani, Brazil).
- Vision, dedication and competence: Brazil and the World (T. Benfey, USA).
- Good chemistry is easily understood chemistry (A. R. H. Cole, Australia).
- Microcomputers in chemical education: Introduction of chemistry to citizens (J. T. Shimozawa, Japan).
- Assessment made by university chemistry students of the explanatory content of justification statements (V. M. S. Gil, Portugal).
- The challenges and opportunities for improving laboratory teaching of chemistry (K. V. Sané, India).
- On the use of atomic orbitals (L. Paoloni, Italy).
- Why do we want to introduce chemistry to the citizen, and who is the citizen? (U. Hofacker, FRG).
- The importance of introducing chemistry to the citizen (B. T. Newbold, Canada).
- Chemistry in action (D. Edwards, UK).
- Chemical tales for children (B. Majoros, Hungary).
- Communicating chemistry via demonstrations (B. Z. Shakhashiri, USA).
- Science, research and education (L. E. Cascarini de Torre, Argentina).
- Learning chemistry by doing projects (J. Josephsen, Denmark).
- Calculations in school chemistry courses — what are their value to the future citizen? (J. Lazonby, UK).
- What is happening to chemistry teaching at secondary level (M. Linguanoto, Brazil).
- Development of a relevant chemistry curriculum for secondary schools in Austria (E. Jarisch, Austria).
- Chemistry in our new world (J. J. Lagowski, USA).

Science and technology education

Science and Technology Education and Future Human Needs is a series of nine volumes concerned with different aspects of science and technology education at all levels (primary, secondary, tertiary, adult and community education). They are the outcome of extensive work over several years by the Committee on the Teaching of Science of the International Council of Scientific Unions (ICSU) which culminated in the Bangalore Conference on Science and Technology Education and Future Human Needs in 1985.

The nine volumes are published for ICSU Press by Pergamon Press, Oxford, UK. They address a number of topics identified as significant for development: health; food and agriculture; energy; land, water and mineral resources; industry and technology; the environment; and information

transfer. In addition, there is a volume devoted to the educational aspects of ethics and social responsibility.

Each of these volumes should provide valuable resource material for educationalists, teachers, curriculum planners, ministry officials and all those involved in teacher training worldwide.

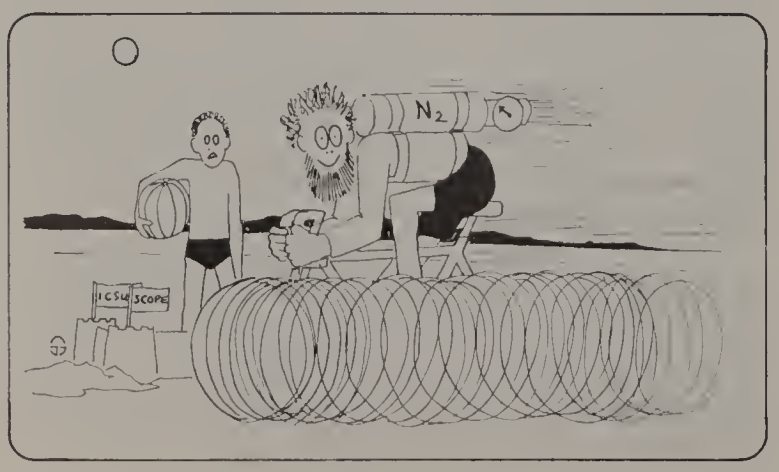
Nitrogen cycling in coastal marine environments

For the past 20 years or so, nitrogen has been recognized as a primary limiting nutrient for algal productivity in coastal waters. The discharge of nitrogen from terrestrial sources has increased dramatically during this period, however, and many coastal environments have suffered from accelerated eutrophication.

From its meetings and publications on element cycling and environmental change, the Scientific Committee on Problems of the Environment (SCOPE) has been a valuable catalyst for presentation and synthesis of new, environmental research information. *SCOPE Report 33: Nitrogen cycling in coastal marine environments* is therefore in accordance with a tradition, but is also a response to the increasing concern about marine eutrophication.

The book contains a number of invited contributions on productivity, regeneration of nutrients, and flow of nitrogen in coastal ecosystems. Emphasis has been placed on including the recent improvements in methodologies and current understanding of process regulation. More integrated research on nitrogen cycling in whole ecosystems has yet to be done, but the editors have incorporated a couple of such studies. Each chapter is clearly unique in terms of emphasis and style. It has been general policy to be generous with space and, if necessary, to accept some inevitable overlaps.

The following is a brief summary of some of the recent research achievements on nitrogen cycling in coastal environments based on the manuscripts and the work of the two editors.



Primary production

Algal nitrogen uptake in the sea is typically approached by ^{15}N methodology, but has been difficult to measure due to very small pool sizes of the nutrients. Measured uptake rates are generally too high as the nutrient pools are increased to concentrations over the K_m for uptake. By comparison, the ^{15}N methodology seems well suited to describe the 'nutritional status' of the algal community (Chapters 1 and 2). It would be interesting to introduce radioactive ^{13}N methodology into studies of nitrogen uptake and primary production, since only this approach may allow the pool sizes to remain low. Algal productivity measured by ^{14}C methodology may alternatively be converted into nitrogen uptake from Redfield's C:N ratio (Chapter 2). Finally, the rate of nitrogen mineralization (ammonium release) which is readily determined by ^{25}N methodology, may also give a measure of total uptake, at least when the nutrient concentrations are constant and low.

Pelagic mineralization

Although pelagic mineralization can be determined by the ^{15}N technique, there are serious gaps in our understanding of organic matter decomposition and the coupling between carbon and nitrogen mineralization in the sea. This is primarily because the nitrogen flow diverges from the carbon flow as the latter is being respired. Another complication is the apparent significance of carbon and nitrogen flow via excretion of dissolved organic matter from the phytoplankton. These organic compounds have a higher C:N ratio than the algae and are primarily decomposed by bacteria and microzooplankton in the 'microbial loop'. Bacterial biomass in turn has a lower C:N ratio than both the algae and their excretion products and may therefore increase the nutritional value of the detritus utilized at higher trophic levels. Chapters 3, 8, 9 and 15 discuss the significance of C:N ratios in dissolved and particulate component of marine foodwebs and elaborate on the production and mineralization at different trophic levels. Until the complicated relationships between carbon and nitrogen mineralization are better understood it may be recommended to double-check and, wherever possible, to measure both of them simultaneously.

Mineralization in the sediment

In relation to nutrient loading and pelagic productivity, the role of sediments is primarily that of detritus decomposition and release of nutrients to the overlying waters. Although benthic primary production and nitrogen fixation may be significant in shallow waters (Chapters 4 and 5), the sedimentation of pelagic production is generally the major

nitrogen input to the sediments. Chapters 8 and 9 present the current methodologies for benthic mineralization (ammonium release, etc.) and discuss the relationships between carbon and nitrogen flow in the benthos. Large contents of nitrogen-containing, osmoregulatory compounds (alkylamines) present a new and interesting aspect of microbial degradation and cycling of non-proteinaceous nitrogen in the coastal sediments (Chapters 6 and 7).

Nitrification and denitrification processes at the sediment–water interface strongly affect the release of regenerated ammonium to the overlying waters, and the formation of atmospheric nitrogen gas by denitrification may represent a significant nutrient sink in coastal ecosystems. The activities have often been difficult to measure *in situ*, but new methodologies have recently demonstrated both a temporal and spatial variation of these processes (Chapters 10 and 11). Recent attention to the benthic macrofauna has further demonstrated that both the decomposition, release of nutrients and loss via nitrification–denitrification can be markedly enhanced in bioturbated sediments (Chapters 10, 12 and 13).

Ecosystem studies and N models

Because of the important role of nitrogen in coastal algal production, there is considerable interest in the significance of terrestrial nitrogen inputs relative to the nutrient regeneration within the coastal ecosystems. As judged from the recent improvements in methodology, there should soon be answers to the important question: What is the impact of continued nitrogen loading on the productivity and water quality of coastal seas? In this context, there is an urgent need for integrated studies of whole ecosystems, specifically on the role of terrestrial inputs versus the local nutrient recycling and on the role of nutrient release and denitrification in the sediments. For instance, only if the significance of nitrogen recycling is determined can the predictive models on algal production and water quality be really useful. Chapters 14, 15 and 16 present some new models of nitrogen cycling in coastal environments which may be useful in relation to management practices.

The report is edited by T. Henry Blackburn and Jan Smrensen and published by John Wiley & Sons, Chichester, UK, 1988. xxv + 451 pp. ISBN 0 471 91404 5. Price GBP 55.00.

SCOPE and ICSU

The Scientific Committee on Problems of the Environment (SCOPE) is one of the scientific committees of the International Council of Scientific Unions (ICSU). An article on SCOPE was published in the December 1985 issue of *CI* (pp. 31–35). Various ICSU activities were described in a report of their 1986 general assembly published in the March 1987 issue of *CI* (pp. 54–62).

Land transformation in agriculture

There is world-wide concern at the way in which land used in agriculture is being transformed. The increasing pressure upon ecosystems as a result of human activity can be seen to imperil the potential provision of food for future world populations.

SCOPE Report 32: Land transformation in agriculture, documents the changes taking place in the agricultural landscape in many parts of the world. It opens with a historical review of the way in which land transformation has been affected since cultivation began. Separate chapters are devoted to the impact of specific factors on the transformation of land, such as irrigation, mechanization, soil erosion, wetland reclamation and the use of fertilizers and pest control. Scientific criteria for observing and measuring changes are proposed. A collection of case studies supplements the text and strengthens the broader observations of the way in which agriculture itself is changing, not only through agricultural practice, but also through pressure from forces external to the landscape.

The breadth of coverage provides a unique review of the current state of agricultural lands all over the world, which will be of interest to agriculturalists, soil scientists, planners, agronomists and geographers.

The report is edited by M. G. Wolman and F. G. A. Fournier and published by John Wiley & Sons, Chichester, UK, 1987. xix + 531 pp. ISBN 0 471 91288 3. Price GBP 72.50.

Dynamic change in ecosystems

SCOPE Report 34: Practitioner's handbook on the modelling of dynamic change in ecosystems by J. N. R. Jeffers outlines the techniques available to scientists who wish to model dynamic change in ecosystems, either those traditionally used for agriculture, or natural systems which are being

destabilized by human intervention. It analyses the data requirements of each modelling technique, its limitations and means of application. The selection of the most appropriate model in a given situation is a vital ingredient in the successful management of ecosystems. This book gives the researcher the opportunity to make the correct choice.

The author introduces ecological theory and the measurement of change in ecosystems and then describes modelling techniques and their interrelationships. Each 'family' of statistical models is then described in detail to assist the researcher.

The book will be of use to scientists working in all areas of environmental science who wish to model dynamic change.

Scope Report 34 *is published by John Wiley & Sons, Chichester, UK, 1988. xiii + 181 pp. ISBN 0 471 10519 8. Price GBP 28.50/USD 67.50.*

Small-angle scattering

The 10th Discussion Conference on Small-Angle Scattering and Related Methods was held in Prague, Czechoslovakia, 13–16 July 1987. The conference was the 7th in a series of conferences held on this topic and was part of the programme of Prague Meetings on Macromolecules organized by the Institute of Macromolecular Chemistry (Czechoslovak Academy of Sciences).

Volume 15 of *Makromol. Chem., Macromol. Symp.* (1988) contains 26 invited lectures from the 10th Discussion Conference.

The contributions cover most aspects of small-angle X-ray and neutron scattering. The papers show advances in the theory, data analysis and new methodological approaches for extracting more information from small-angle experiments.

Attention is devoted to progress in the use of experimental techniques, such as synchrotron radiation, neutron scattering, and time-resolved measurements. Also presented are applications of new techniques in the study of the structure of a broad spectrum of materials, that is, biopolymers, polymers, emulsions, micellar systems, metals, catalysts, carbons, and glasses.

A youngster from Zaire: one of many victims of smallpox. The last reported naturally-occurring case of smallpox occurred in Merka, Somalia in October 1977. The WHO smallpox eradication programme was the first and only time a positive attempt to eradicate an infection had succeeded. The benefits in terms of reduction in morbidity and mortality were obvious — in financial terms, the outlay of USD 200 million has been estimated to result in annual savings of USD 1500 million. (*Photo courtesy WHO/UN*)

Smallpox and its eradication

Smallpox and its eradication recounts the history of one of humanity's worst diseases, moving from ancient times, through the discovery of vaccination, to the WHO-led campaign that finally conquered the disease. The book gives a minutely detailed account of both how the disease once reigned and what was necessary, step by step and country by country, to eliminate the "ancient scourge" once and for all.

The book serves as a complete and final review of knowledge on the clinical features, virology, pathology, immunology, and epidemiology of variola major and minor. It also offers access to a wealth of previously unpublished data and personal experiences that make up the saga of a public health event unprecedented in scope and unparalleled in the magnitude of its achievement.

Smallpox and its eradication *is written by F. Fenner, D. A. Henderson, I. Arita, Z. Jezek and I. D. Ladnyi and published by the World Health Organization (WHO), Geneva, Switzerland, 1988. pp. 1500 (approx). ISBN 92 4 156110 6. Price CHF 250.–/ USD 150.00. The book can be ordered from: World Health Organization, Distribution and Sales, Attn: A. C. Wieboldt, 1211 Geneva 27, Switzerland.*

International Pharmacopoeia

The International Pharmacopoeia, 3rd Edition, Volume 3: *Quality Specifications* presents quality specifications for 157 widely used pharmaceutical substances. The volume, which is a continuation of Volume 2 of the *International Pharmacopoeia*, provides monographs for most substances contained in the WHO Model List of Essential Drugs. Quality specifications were established in consultation with numerous specialists, several pharmacopoeia commissions, and a number of national institutes for drug quality control.

In keeping with the overall purpose of the *International Pharmacopoeia*, the monographs are based on sound, classical chemical methods appropriate for use in small- and medium-sized laboratories. Searching techniques, such as high-performance liquid chromatography, have been included only when necessary for the adequate control of certain complex materials.

The monographs for substances are arranged in alphabetical order by Latin name. Each monograph gives clear and concise information on nomenclature, formulae, chemical names, description, solubility data, storage conditions, category, identity tests, purity requirements and assays. Presentation of alternative tests, requiring less sophisticated equipment and yet capable of yielding reliable information on quality, helps enhance the applicability of the pharmacopoeia to a large range of laboratory settings.

The volume also includes a list of reagents, test solutions, and volumetric solutions followed by expanded information on some general methods, and amendments to the previous volumes. Use of the pharmacopoeia is further facilitated by inclusion of an extended index, including references to the reagents, test solutions, and volumetric solutions described in previous volumes.

The International Pharmacopoeia, *3rd Edition, Volume 3*: Quality Specifications *is published in English by the World Health Organization, Geneva, 1988. 407 pp. ISBN 92 4 154152 0. Price CHG 64.–/ USD 38.40. French and Spanish editions are in preparation.*

ISO Memento and Catalogue 1988

The International Organization for Standardization's *ISO Memento 1988* gives full details on the technical structure of ISO and its 2400 technical bodies.

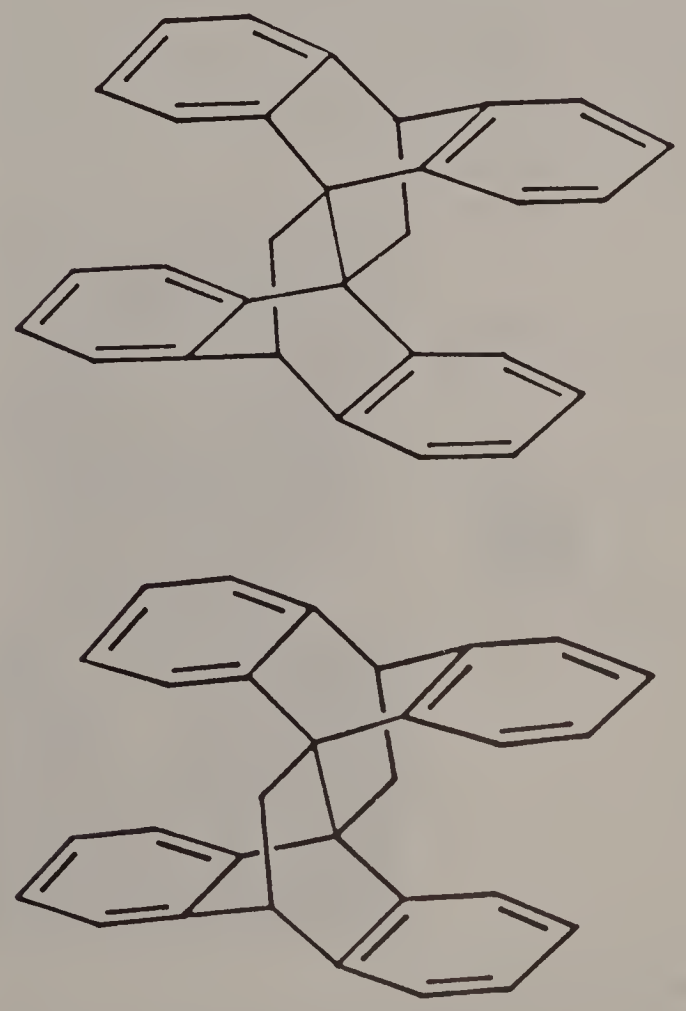
The *ISO Catalogue 1988* is essentially the same as that of the 1987 edition, but the structure is now entirely different. The new catalogue lists ISO standards under 39 fields of interest, each being subdivided into subject groups. Standards now appear in up to five places in order to help selection of standards on inter-related subjects and the fields/ groups are numbered to facilitate standing order arrangements.

Both the volumes provide information in both English and French. A Russian version of the memento is available as a separate publication.

ISO Memento 1988, *154 pp. ISSN 0536 2067/ISBN 92 67 01046 8. Price CHF 34.– and ISO Catalogue 1988, 847 pp. ISSN 0303 3309/ISBN 92–67–01049–2. Price CHF 40.– are available from: International Organization for Standardization. Case postale 56, CH-1211 Genève, Switzerland.*

Spot the difference

Can you spot the difference between the following two structures representing **lepidoterene**?



If you can, you are more vigilant than the editor of *Chemistry International*. The structure above is incorrect whereas the one below is correct. Guess which one appeared in Dr Metanomski's article on "Unusual names assigned to chemical substances" (see November 1987 issue, page 213). Thanks to Prof. Snatzke (Ruhr-Universität Bochum, FRG) and Dr Metanomski for pointing out this error.

Bioprocess engineering

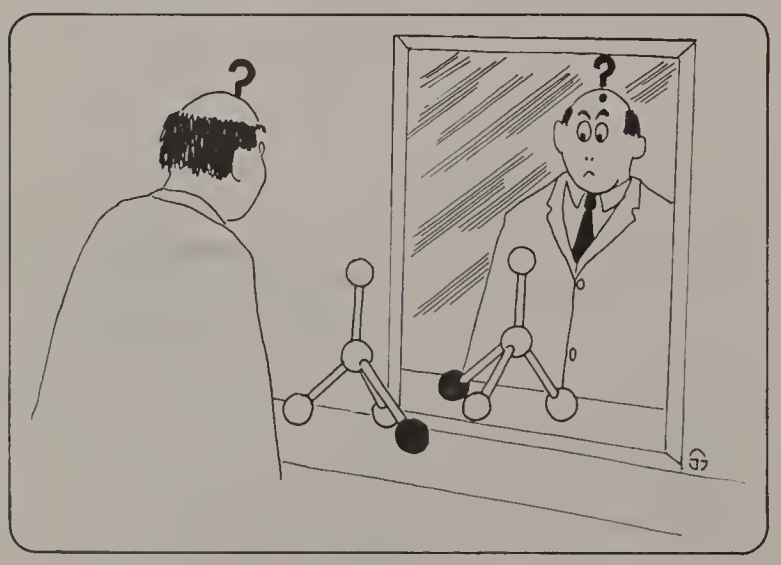
An international course and symposium on "Recent advances in bioprocess engineering" will be held at the Indian Institute of Technology, New Delhi, 12–20 December 1988.

Further information from: Prof. T. K. Ghose, Chairman of the National Organizing Committee, International Course cum Symposium on Recent Advances in Bioprocess Engineering, Biochemical Engineering Research Centre, Indian Institute of Technology, Hauz Khas, New Delhi-110 016, India. Tel: 654110, 654023; Cable: TECHNOLOGY, Delhi ATTN: BERG; Telex: 31–61886 EMBT IN ATTN: BERC.

PAC Review

In this section we take a brief look at the symposia and lectures published in recent issues of *PAC. Pure and Applied Chemistry (PAC)* is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*.

Asymmetric synthesis

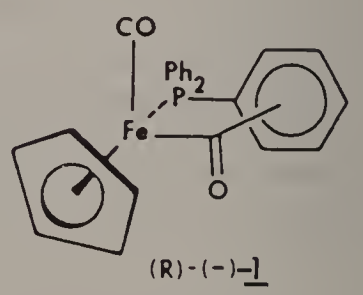


The iron chiral auxiliary $[(n^5\text{–}C_5H_5)Fe(CO)(PPh_3)]$ has been extensively developed over the past few years for the asymmetric synthesis of organic molecules generally via carbon–carbon bond forming reactions. The iron chiral auxiliary exerts powerful stereochemical control in a wide variety of reactions of attached acyl ligands including alkylations, aldol reactions, tandem Michael additions and alkylations and Diels–Alder reactions. The potential of the parent iron acetyl complex *1*, which is now commercially available, for asymmetric synthesis can be illustrated by the asymmetric synthesis of the anti-hypertensive drug (−)-captopril and of a variety of β-lactams.

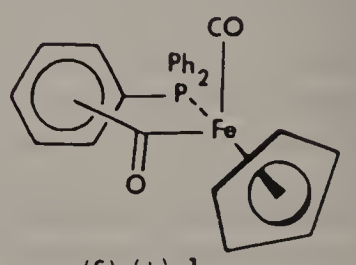
The iron acetyl complex *1* is a chiral pseudo-octahedral complex with the structure shown in the figure. It is orange air-stable crystalline material which when enantiomerically pure is configurationally stable.

The conformation adopted by the acetyl ligand of *1* in the solid state is such that the acyl oxygen lies approximately anti-periplanar to the carbon monoxide ligand. In order to minimize the steric interactions between the phenyl rings and the acetyl ligand the triphenylphosphine orientates itself so as to place one phenyl group under and approximately parallel to the acetyl ligand. There is a great deal of theoretical and experimental evidence to suggest that this is the favoured conformation for any acyl attached to the iron chiral auxiliary.

There is a further degree of stereochemical complexity present in these complexes, namely the sense of the screw of the triphenylphosphine rotor. To date all acyl complexes of this type so far studied exhibit the same screw as shown in the



(R)-(−)-1



(S)-(+)-1

Stephen Davies — at the unexplored interface of inorganic and organic chemistry

"Modern chemistry can now achieve the synthesis of virtually any organic structure in racemic form. If optically pure material is required the two enantiomers then have to be separated and this is often impossible or at least difficult and costly. There is no doubt that the development of a general method for the asymmetric synthesis of virtually any organic molecule would have far-reaching consequences.

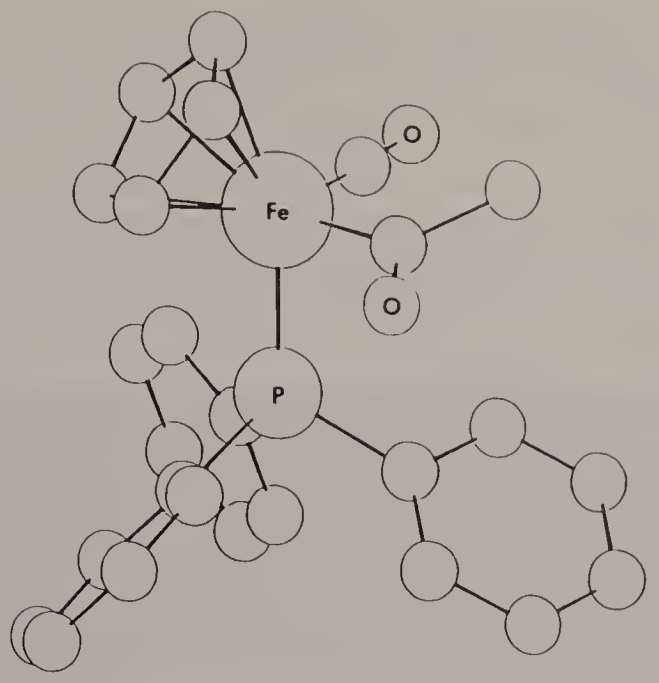
"Our long-term research objective is the development of truly artificial enzymes that display all the properties of natural enzymes but with the major advantage of being generally applicable to the synthesis of either enantiomer of any desired molecule. Our approach involves the exploitation of the unique spatial control that can be achieved with organotransition metal complexes. This general area is at the interface of inorganic and organic chemistry and remains virtually unexplored.

"We have developed an iron-based chiral auxiliary with a molecular weight of less than 500 for the stoichiometric synthesis of single enantiomers of organic compounds."

figure again to minimize steric interactions with the other ligands.

The above discussion is based on the introduction of a paper on "Asymmetric synthesis via the iron chiral auxiliary $[(\eta^5\text{–}C_5H_5)Fe(CO)(PPh_3)]$ by Stephen G. Davies (University of Oxford, UK). The paper was presented at the 4th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS-IV) held in Vancouver, BC, Canada: 26–30 July 1987.

At the same meeting Howard Alper (University of Ottawa, Canada) presented a paper on "Metal catalysed carbonylation and oxidation–reduction reactions". He reported that the selective reduction



X-Ray crystal structure of $[(\eta^5\text{–}C_5H_5)Fe(CO)(PPh_3)COCH_3]$.

or oxidation of carbonyl compounds, as well as the synthesis of the latter from olefins, occurs under remarkably mild conditions using rhodium, rhenium, or palladium complexes as catalysts, and cyclodextrins or polyethylene glycols as phase transfer catalysts.

Howard Alper who presented a paper on "Metal catalyzed carbonylation and oxidation-reduction reactions" at OMCOS-IV in Vancouver.

Alper described homogeneous or phase transfer catalysed carbonylation of olefins, epoxides and thiiranes to acids, esters, and lactones using cobalt and palladium catalysts. The rhodium(I) catalysed carbonylation of aziridines to β-lactams is a stereospecific and enantio-specific process. The presence of d or l-menthol results in high asymmetric induction using racemic aziridines as substrates.

The plenary and invited lectures presented at OMCOS-IV were published in the January 1988 issue of *PAC*.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Atomic weights of the elements 1987

The biennial review of atomic weight A_r(E) determinations and other cognate data has resulted in only one change from the 1985 values; namely, A_r(E) for gallium is changed from 69.723 ± 0.004 to 69.723 ± 0.001. Attention is drawn to new isotopic abundance determinations of boron which indicate a real variation in commercial sources which at this time can be accommodated within the existing uncertainty of the standard atomic weight. The Table of Isotopic Compositions of the Elements will not be published as part of this biennial report but a revised table is in course of preparation. Current data on isotopic compositions of non-terrestrial materials are included together with a description of continuing work on natural isotopic fractionation which occurs for some elements. A review of the Tables of Atomic Weights both to Four and Five Significant Figures is being undertaken.

This report was prepared by the Commission on Atomic Weights and Isotopic Abundances (II.1) and published in PAC, *Vol. 60, No. 6, pp. 841–854, 1988.*

Protocol for the design, conduct and interpretation of collaborative studies

The minimum requirements accepted by consensus of 27 participants at an IUPAC Workshop for the design, conduct, and interpretation of collaborative interlaboratory studies are given.

This document deals with a collaborative study (as distinct from a proficiency study or a certification study). The document emphasizes the need for a preliminary optimization of the candidate method within at least a single laboratory to avoid wasting the power and expense of a collaborative study on a relatively untested method.

The recommended protocol developed for a collaborative study of the optimized method indicates the required numbers of materials, laboratories, and replicate analyses arranged according to specific designs. The protocol also specifies the method for removal of outliers, designates the statistical parameters to be calculated from the valid data, and suggests a format for reporting the results of the statistical analysis.

This report was prepared by the Interdivisional Working Party for Harmonization of Quality Assurance Schemes for Analytical Laboratories and published in PAC, *Vol. 60, No. 6, pp. 855–864, 1988.*

Recommendations for the determination of pH in sea water and estuarine waters

The problems of the measurement of the operational pH in sea water and variable ionic strength media estuarine waters are reviewed and methods are recommended by which reproducible values can be obtained.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) Subcommittee on Electroanalytical Methods of Environmental Trace Analysis and published in PAC, *Vol. 60, No. 6, pp. 865–870, 1988.*

HPLC methods for the determination of patulin in apple juice

Two HPLC methods for the determination of patulin in apple juice were collaboratively tested in 12 laboratories from 10 countries. The collaborators themselves spiked the previously pasteurized apple juice samples with patulin standard solution before analysis. Two samples at three levels of fortification and one blank sample were analysed for each tested method. Although both of the methods were based on reversed phase HPLC they employed different clean-up procedures: partitioning extraction and column chromatography. Mean recoveries of patulin ranged from 77 to 85% and mean coefficients of variation were 7.3% and 15% for the two methods respectively.

This report was prepared by the Commission on Food Chemistry (VI.1) and published in PAC, Vol. 60, No. 6, pp. 871–876, 1988.

Determination of tocopherols and tocotrienols in vegetable oils and fats by high performance liquid chromatography: results of a collaborative study and the standardized method

The development, by collaborative study, of a standardized method of the determination of toco-

pherols and tocotrienols in vegetable oils and fats is described. The procedure involves separation of the individual tocopherols and tocotrienols by the direct high-performance liquid chromatography (HPLC) of a solution of the oil or fat in organic solvent. The application of the procedure to processed products such as margarine containing added tocopherol esters was also studied.

This report was prepared by the Commission on Oils, Fats and Derivatives and published in PAC, *Vol. 60, No. 6, pp. 877–892, 1988.*

Determination of copper, iron and nickel in oils and fats by direct graphite furnace atomic absorption spectrometry: results of a collaborative study and the standardized method

A description is given of the development by collaborative study of a standardized method for the determination of copper, iron and nickel in edible oil and fats by direct graphite furnace atomic absorption spectrometry. The procedure is both rapid and sensitive allowing determination at levels of 0.005–0.20 mg kg^{-1} for copper and 0.01–1.00 mg kg^{-1} for iron and nickel.

This report was prepared by the Commission on Oils, Fats and Derivatives and published in PAC, *Vol. 60, No. 6, pp. 893–900.*

Recommended approach to the evaluation of the environmental behaviour of pesticides (IUPAC reports on pesticides, no. 24)

Concepts and experimental approaches are proposed which lead to a rational testing of the fate of pesticides in soil, water, air, plants and animals. The stepwise test programme presented is flexible, cost effective and ensures that all aspects of a pesticide's environmental fate are studied in sufficient detail. It also indicates, at different stages of testing, the results which are of relevance to the estimation of exposure to this pesticide, an essential element of the hazard assessment process concerning producers/applicators, consumers and the environment.

This report was prepared by the Commission on Agrochemicals (VI.5) and published in PAC, *Vol. 60, No. 6, pp. 901–932, 1988.*

Conferences

Vapour–liquid equilibria *Thessaloniki, Greece, 24–26 October 1988*

The 4th International IUPAC Workshop on Vapour–liquid Equilibria in 1-Alkanol + *n*-Alkane Mixtures: Applications will be held in the modern conference complex of the International Trade Fair of Thessaloniki. The workshop is being organized by the Chemical Process Engineering Research Institute and the Aristotelian University of Thessaloniki.

The scientific programme includes the following lectures:

- Vapour–liquid equilibria of alkanol + alkane mixtures in oil and gas process developments (A. Pucci, France).
- Catalytic synthesis of alkanol + alkane mixtures and their applications as transportation fuels (K. Klier, USA).
- Vapour pressure of 1-alkanols and *n*-alkanes: selected and recommended data (K. Aim, Czechoslovakia).
- Correlation of synthesis gas solubility in *n*-paraffin solvents and Fischer–Tropsch waxes (K. C. Chao, USA).
- New applications of the ERAS model to associated solutions (A. Heintz, FRG).
- Data needs for a liquid-phase methanol reaction (J. Lovland, Norway).

Contributed papers — including poster communications — will cover the following topics: thermophysical properties of *n*-alkanes and 1-alkanols (vapour pressures, critical properties, orthobaric densities, heat capacities, second virial coefficients, heats of vaporization); measured data and data needs in scientific and technological applications; data correlation and prediction methods for the thermophysical properties of alkanol + alkane mixtures and properties of multicomponent mixtures containing alkanols and/or alkanes; use of oxygenates in gasoline; relevant database demonstrations.

The workshop will be conducted in English. The registration fee is USD 200. This entitles the

registrant to participate both at the scientific sessions and in the social programme and also to a copy of the final programme, an extended abstracts volume and refreshments during breaks. Affiliates are entitled to a 10% reduction of the registration fee.

Accommodation is available in local hotels at rates ranging from GRD 3000 to GRD 12 000.

Thessaloniki is the second largest city of Greece and the capital of the province of Macedonia. The city has a history of 23 centuries. Its airport is accessible to all major European capitals via Frankfurt, Munich, Paris, Vienna or Zurich. Like other Greek provinces, Macedonia is rich in archaeological sites and monuments from the Classical, Roman and Byzantine periods.

Weather in Thessaloniki at the time of the workshop is pleasant with an average temperature of about 20°C.

Surface chemistry, adsorption and chromatography *Moscow, USSR, 13–17 November 1988*

The International Symposium on Surface Chemistry, Adsorption and Chromatography will be held in the M. V. Lomonosov Moscow State University in November. The symposium is organized by the Scientific Council on Chromatography of the Academy of Sciences of the USSR and will commemorate the contributions of Prof. A. V. Kiselev to this field of physical chemistry. The symposium will coincide with his 80th birthday.

The scientific programme will consist of about 40 invited lectures and 150 posters grouped under the following topics:

- Structure and surface chemistry of carbon.
- Structure and surface chemistry of polymers.
- Graphitized carbon black in chromatography.
- Adsorption phenomena in gas chromatography.
- Intermolecular interactions, adsorption, liquid chromatography.
- Sorbents for chromatography.
- General aspects of adsorption.

The official languages of the symposium will be English and Russian. Translation from English to Russian and Russian to English will be provided. Invited lectures will be published in *PAC*.

The registration fees are SUR 80 for active participants, SUR 50 for students and SUR 40 for accompanying persons. A 10% reduction is available to IUPAC affiliates. The fee covers entrance to all scientific sessions, exhibitions, symposium

M. V. Lomonosov Moscow State University (right) with a statue of Lomonosov in the foreground. The university is the venue of the International Symposium on Surface Chemistry, Adsorption and Chromatography. Below, Dr Lubov Belyakova (left) and Prof. Vadim Davankov (right), members of the Symposium Committee, at a meeting in Moscow in May with the Editor of *Chemistry International*.

materials (except the special volume of *PAC*), refreshments during breaks, a get-together party and a farewell banquet.

Accommodation is available in hotels and will be arranged by the Academy of Sciences and Moscow University. Costs range from SUR 56 to SUR 93 per person per day.

In November the weather in Moscow is cold with temperatures between 0°C and +5°C.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1988

Coordination Chemistry

28 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. M. A. V. Ribeiro da Silva, XXVI ICCC, Department of Chemistry, Faculdade de Ciẽncias, 4000 Porto, Portugal.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(IUPAC Conference, PO Box 119, CS–160 Praha 6, Czechoslovakia.)

Molecules and Molecular Crystals

29 August–3 September. International Symposium on the Electronic Structure and Properties of Molecules and Molecular Crystals. Cavtat–Dubrovnik, Yugoslavia.
(Prof. Z. B. Maksic, Chairman of the Organizing Committee, Ruder Boskovic Institute, PO Box 1016, YU-41001 Zagreb, Yugoslavia.)

Macrocyclic Chemistry

4–8 September. 13th International Symposium on Macrocyclic Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, Varrentrappstr. 40–42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Organometallic Chemistry

4–9 September. 13th International Conference on Organometallic Chemistry. Turin, Italy.
(Prof. Luciano Milone, Istituto di Chimica Generale ed Inorganica, Facoltà di Farmacia, Università di Torino, Via P. Giuria 9, I–10125 Torino, Italy.)

Automation and New Technology in Clinical Laboratory

5–8 September. 3rd International Congress on Automation and New Technology in Clinical Laboratory. Kobe, Japan.
(Dr Kiyoshi Okuda, Department of Laboratory Medicine, Central Clinical Laboratory, Osaka City University Medical School, Abeno, Osaka 545, Japan.)

Nickel Metabolism and Toxicology

5–9 September. Fourth International Conference on Nickel Metabolism and Toxicology. Helsinki, Finland.
(Fourth International Conference on Nickel Metabolism and Toxicology, c/o Institute of Occupational Health/Ms. Hikka Bergman, Topeliuksenkatu 41 a A, SF–00250 Helsinki, Finland.)

Raman Spectroscopy

5–9 September. XIth International Conference on Raman Spectroscopy. London, UK.
(Dr J. F. Gibson, Secretary (Scientific), Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.)

Vapour–Liquid Equilibria

24–26 October. Fourth International Workshop on Vapour–Liquid Equilibria in 1-Alkanol + *n*-Alkane Mixtures: Applications. Thessaloniki, Greece.
(Prof. I. A. Vasalos, Chemical Process Engineering Research Institute and Department of Chemical Engineering, University of Thessaloniki, 54006 Thessaloniki, Greece.)

Surface, Adsorption & Chromatography

13–17 November. International Symposium on Surface, Adsorption & Chromatography (dedicated to the memory of A. V. Kiselev.) Moscow, USSR.
(Prof. O. G. Larionov, Scientific Council on Chromatography, Institute of Physical Chemistry, Leninskii prospekt 31, 117915 Moscow, USSR.)

Oils, Fats and Waxes

12–17 February. International Conference on Oils, Fats and Waxes. Auckland, New Zealand.
(Dr L. Eyres, c/o NZ Dairy Board, Cream Products Division, PO Box 417, Wellington, New Zealand.)

Inorganic Materials at High Temperatures

3–7 April. Sixth International Conference on High Temperatures: Chemistry of Inorganic Materials at High Temperatures. Gaithersburg, Maryland, USA.
(Dr J. W. Hastie, Group Leader, High Temperature Chemistry, National Bureau of Standards, Gaithersburg, MD 20899, USA.)

Cationic Polymerization

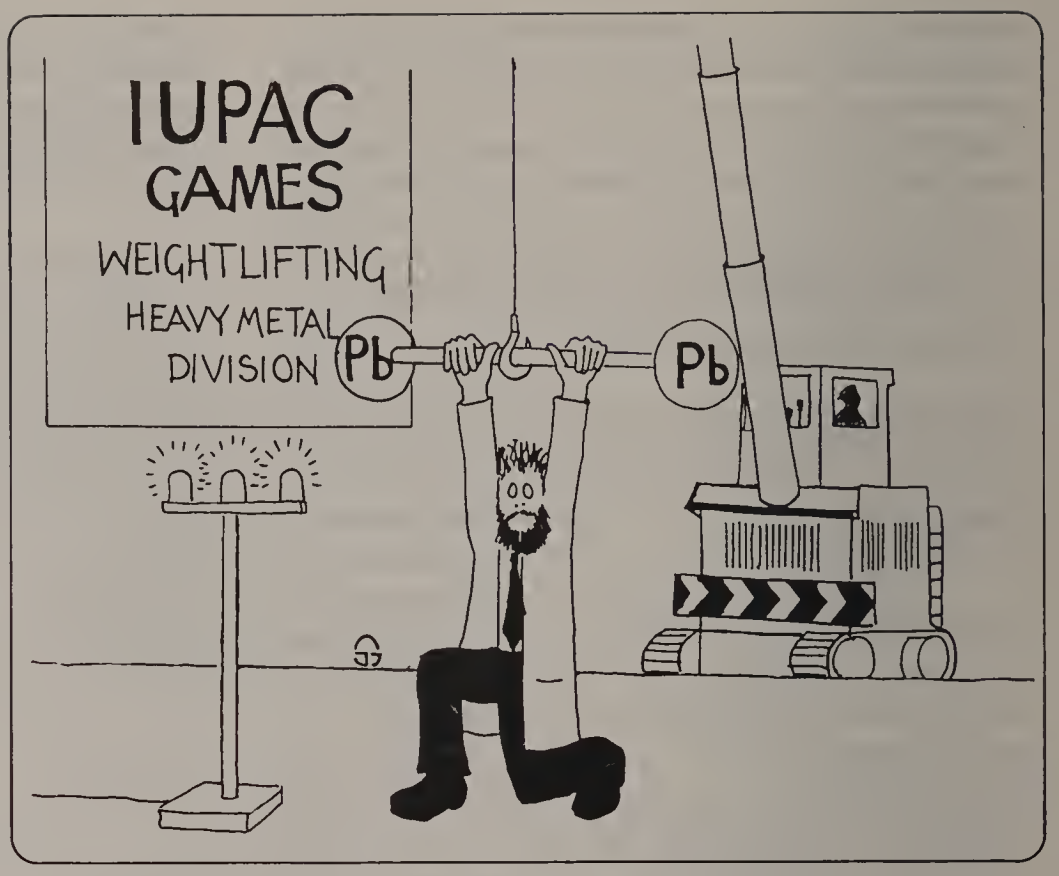
5–9 June. Ninth International Symposium on Cationic Polymerization and Related Processes. Strasbourg, France.
(Secretariat of the 9th Symposium on Cationic Polymerizations, Institut Charles Sadron (CRM/EAHP), 6 rue Boussingault, 67083 Strasbourg Cedex, France.)

Fats

6–9 June. International Congress Chevreul or Study of Fats. Angers, France.
(Chevreul International Congress Angers 1989, Centre de Congrès, 33 boulevard Carnot, 49100 Angers, France.)

Molecular Design of Functional Polymers

26–28 June. International Symposium on Molecular Design of Functional Polymers. Seoul, Korea.
(Secretariat, IUPAC International Symposium, c/o Polymer Society of Korea, Rm. 601, Hyecheon Building, 831 Yeoksam-dong, Kangnam-ku, Seoul 135–792, Korea.)



Coordination Chemistry

2–7 July. 27th International Conference on Coordination Chemistry. Queensland, Australia.
(XXVII ICCC Conference Secretariat, UniQuest Limited, University of Queensland, St Lucia, Queensland, Australia.)

Phosphorus Chemistry

3–8 July. 11th International Conference on Phosphorus Chemistry. Tallinn, USSR.
(Prof. M. Veiderma, Technical University, 5 Ehitajate Road, Tallinn 200108, Estonian SSR, USSR.)

Polymer Blends

17–20 July. 32nd Microsymposium on Macromolecules "Polymer Blends". Prague, Czechoslovakia.
(Dr P. Čefelín, PMM Chairman, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovskeho n. 2, 16206 Prague 6-Petriny, Czechoslovakia.)

Heteroatom Chemistry

17–22 July. Second International Conference on Heteroatom Chemistry (ICHAC-2). Albany, New York, USA.
(Prof. E. Block, Chairman, ICHAC-2, Department of Chemistry, State University of New York at Albany, Albany, NY 1222, USA.

Bioinorganic Chemistry

24–28 July. Fourth International Conference on Bioinorganic Chemistry. Cambridge, Massachusetts, USA.
(Prof. K. D. Karlin, Department of Chemistry, SUNY at Albany, NY 12222, USA.)

Analytical Chemistry

30 July–5 August. SAC 89: International Conference on

Analytical Chemistry. Cambridge, UK.
(The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

IUPAC Congress

2–7 August. 32nd IUPAC Congress. Stockholm, Sweden.
(IUPAC, c/o Stockholm Convention Bureau, Box 6911, S-10239 Stockholm, Sweden.)

Solution Chemistry

6–11 August. 20th International Conference on Solution Chemistry. Jerusalem, Israel.
(Prof. Y. Marcus, Department of Inorganic & Analytical Chemistry, The Hebrew University of Jerusalem, 91904 Jerusalem, Israel.)

IUPAC General Assembly

9–17 August. 35th IUPAC General Assembly. Lund, Sweden.
(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Hiizu Iwamura, General Secretary of ISNA-6, Department of Chemistry, Faculty of Science, The University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

Calorimetry and Chemical Thermodynamics

25–28 August. International Conference on Calorimetry and Chemical Thermodynamics. Beijing, China.
(Prof. Hu Ri-heng, Institute of Chemistry, Academia Sinica, Beijing, China.)

Mössbauer Effect

4–8 September. International Conference on the Applications of the Mössbauer Effect. Budapest, Hungary.
(Dr D. L. Nagy, Central Research Institute for Physics, PO Box 49, H-1525 Budapest, Hungary.)

Plasma Chemistry

4–8 September. 9th International Symposium on Plasma Chemistry. Pugnochiuso, Italy.
(Prof. R. d'Agostino, Centro di Studio per la Chimica dei Plasmi, Dipartimento di Chimica, Università di Bari, Via Amendola 173, 70126 Bari, Italy.)

1990

Natural Products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Prof. Sukh Dev, Malti-Chem Research Centre, Nandesari, Baroda-39340, India.)

Porous Solids

6–9 May. Second International Symposium on Characterization of Porous Solids (COPS-2.) Alicante, Spain.
(Prof. F. Rodriguez-Reinoso, Departamento de Química Inorgánica e Ingeniería Quimica, Faculted de Ciencias, Universidad de Alicante, Apartado 99, Alicante, Spain.)

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO, Box 900440, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical Organic Chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitzhak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000 Israel.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

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HYDROGEN SULFIDE, DEUTERIUM SULFIDE AND HYDROGEN SELENIDE

Edited by **P G T FOGG**, *Polytechnic of North London, London, UK* & **C L YOUNG**, *University of Melbourne, Parkville, Victoria, Australia*

Published solubility data for the title compounds in pure aqueous, mixed aqueous and non-aqueous solvent systems have been critically evaluated; recommended values are indicated where appropriate. Literature coverage is complete to January 1987. Many of the systems included are used to remove hydrogen sulfide in industrial processes, and industrially important systems including carbon dioxide are also discussed.

For inorganic, physical and organic chemists, and chemical engineers.

Contents: Foreword. Preface. The solubility of gases in liquids: 1. Hydrogen sulfide in aqueous solvents: Water. Solutions of weak or non-electrolytes. Solutions of strong electrolytes. Sea-water. Solutions of ammonia. Solutions of alkanolamines. 2. Hydrogen sulfide in non-aqueous solvents: Critical evaluation data. Hydrocarbons. Alcohols. Ethers and polyglycols. Other compounds of carbon, hydrogen and oxygen. Compounds containing silicon. Compounds containing halogen. Compounds containing nitrogen. Compounds containing sulfur. Compounds containing phosphorus. Deuterium sulfide in deuterium oxide. Hydrogen selenide in aqueous and non-aqueous solvents. System index. Registry number index. Author index.

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IUPAC Secretariat

Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)
Telephone: + 44 (865) 747744 Telex: 83220 IUPAC G Telegrams: IUPAC OXFORD
Fax: + 44 (865) 747510

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 43 countries, each represented by a national organization, such as an academy of science or research council.

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PRODUCTION EDITOR: Cam Appleby

All correspondence to be addressed to The Editor, Chemistry International, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, England (telephone: + 44 (865) 747744).

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Front cover: Presidium of the Academy of Sciences of the USSR, Moscow, venue of the Executive Committee meeting.

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The chemist at work

"I hold every man a debtor to his profession from the which as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves by way of amends to be a help and ornament thereunto."

Francis Bacon

The chemist as an employee — ethical obligations

The ethical duties of chemists in all fields of employment are:

- to fulfil their contractual responsibilities in letter and in spirit;
- to serve the interests of their employer in good faith and to the best of their ability;
- always to keep in mind the primary obligation — to serve the public interest and maintain and enhance the reputation of the profession.

How these obligations are interpreted will vary from one job to another, but there is an obligation:

- to apply knowledge and skills in a positive and imaginative way, not just to obey instructions;
- to share with the employer a high degree of trust and confidence;
- to be willing to work, on occasions, without regard to normal hours of duty;
- to accept and carry out instructions from a superior, subject to the right to have reservations put on record, and to request access to higher authority on matters of importance;
- to accept that resignation or dismissal may be the ultimate consequence of sustained protest on a matter of conscience or judgement.

The chemist has an obligation to serve the public interest and maintain and enhance the reputation of the profession. (*Photo courtesy ISC Chemicals Ltd.*)

The chemist in education

Chemists engaged in teaching at every level have a special responsibility in that they lay the foundations on which scientific and professional standards will ultimately be built. They have an obligation not only to their students, but also to the profession as a whole, because its future may be markedly determined by their influence on those of their students who choose to become professional chemists.

In addition to their other duties, they should set a meticulous example to the young people in their charge, taking account of youthful high spirits, inexperience, and occasional irresponsibility. An incompetent, careless or otherwise unprofessional teacher can do great harm through the deficiencies of a student, perhaps years after they have parted company.

It is important to emphasize the especially significant role of teachers in chemistry in the tertiary sector. These teachers inevitably have a very important influence upon the ultimate professional and ethical standards of their students. In addition to imparting accurately the appropriate factual and scientific information, they should not ignore the philosophical and ethical implications of chemistry.

Science in general, and chemistry in particular, is dedicated to the most accurate description of truth as perceivable at a particular time. The highest standards of personal integrity and attention to accuracy should therefore be exercised in chemical investigations and in the recording of results since anything less is unscientific, and is necessarily incompatible with high professional standards.

The above are excerpts from the booklet, Guidance on Professional Conduct *published by the Royal Society of Chemistry, London, UK, 1988. The booklet was distributed to all RSC members and is available to non-members for GBP 5.00.* Chemistry International *and IUPAC wish to thank the Royal Society of Chemistry for permission to reproduce these excerpts which are copyright of the Royal Society of Chemistry 1988.*

News & Views

The work of WHO

The Work of WHO, 1986–1987 is the latest biennial report of the Director-General of the World Health Organization to the World Health Assembly and to the United Nations. The report contains six sections including the following: Health system infrastructure; Health science and technology — health promotion and care; and Health science and technology — disease prevention and control.

The report is published by WHO, Geneva, Switzerland, 1988. xvi + 250 pp. ISBN 92 4 156113 0. Price CHF 45.–.

We regret to record the death of:

Prof. A. S. Kertes

Prof. A. S. Kertes, Israel (8 July 1988) — Commission on Equilibrium Data (1967–1983), Commission on Colloid and Surface Chemistry including Catalysis (1979–1985), Commission on Solubility Data (1979–1987), Analytical Chemistry Division Committee (1987–1988).

New AOAC Executive Director

The Association of Official Analytical Chemists (AOAC) has appointed Ronald R. Christensen as its new Executive Director. He assumed his responsibilities on 2 May 1988.

Christensen was Executive Vice President of the Society of American Foresters from 1985 to 1987. His appointment follows the resignation of David Maclean who joined AOAC as Executive Director in 1977.

Federation of European Chemical Societies (FECS) General Assembly

The 19th General Assembly of FECS was held in Szirák, Hungary on 23rd June 1988. Thirteen of the thirty-seven member societies were represented, including Chemische Gesellschaft der DDR as a new member.

In addition to the annual report of the federation for 1987, written reports were received from the Working Parties on Analytical Chemistry (Prof. L. Niinisto), Chemistry and the Environment (Mr G. J. Dickes), Electrochemistry (Dr J. Mrha), History of Chemistry (Dr J. W. van Spronsen), Interfacial Phenomena (Dr C. Taupin), Organometallic Chemistry (Prof. S. Pasynkiewicz), Professional Affairs (Mr C. B. F. Rice), Chemical Education (Dr U. Hofacker), and from the Discussion Group on Chemistry in Conservation of the Cultural Heritage (Prof. F. Piacenti). Interface papers on "Chemists and computing professionals" (final version) and on "Chemists and other professionals in the field of analytical chemistry" (interim) were tabled.

A Discussion Group on Computational Chemistry was approved (Chairman, Prof. F. Bernardi/Italy), to cover promotion of contacts among computational chemists, organization of meetings on a regular basis, sponsorship of scientific exchange, support of research initiatives, software exchange.

A new federation statute was approved so that independently created European groups in special fields of chemistry which are autonomous, may become "Associated Organizations of FECS". Such associated organizations may apply for the status of working parties of the federation.

Material collected from member societies on "Interface University/Chemical Industry" was to be evaluated (Dr R. Darms/Switzerland), and its relationship considered to the Professional Affairs Working Party project on "Links between chemical industry and higher education".

Unfortunately, the First Eurasia Chemical Conference, a joint venture of FECS and the corresponding Asian Federation (FACS) scheduled for 16–21 November 1988, would not now take place.

Dr M. Williams

Dr Wolfgang Fritsche (Gesellschaft Deutscher Chemiker — on right) receives from Prof. Giancarlo Jommi (Chairman, FECS Council) a diploma to mark his retirement after 12 years as one of the Federation's General Secretaries. ▼

Prof. V. F. Rostinov (All-Union Mendeleev Society), who suggested a FECS initiative on young chemists' affairs, especially at the secondary level of education. ▼

▲
Prof. Egon Fanghänel (President, Chemische Gesellschaft der DDR) and Dipl.-Ing. Renate Schmeisser (Scientific Secretary) sitting with Dr Gábor Náray-Szabo (Hungarian Chemical Society — on right), who continues as the other General Secretary for the next three years.

▲
Dr Jack Gow (Royal Society of Chemistry), who succeeds Dr Fritsche as FECS General Secretary.

Executive Committee meet in Moscow and visit Siberia

The 1988 spring meeting of the IUPAC Executive Committee was held by invitation of the Academy of Sciences of the USSR at the Academy Presidium in Moscow on 16–17 May. Prof. Tom West reports on the meeting in his Secretary General's Column on pages 217–221.

Afterwards the committee members were invited to Novosibirsk Akademgorodok, Siberia, as the guests of the President, Valentin Koptyug, and the academy where they visited some of the many institutes of the academy. They also heard about current research projects at the institutes. A report on the visit to Siberia will appear in the next issue of *Chemistry International*.

A flying shark missed the IUPAC Secretariat in Cowley, Oxford by no more than a few streets when it nose-dived into a house in New High Street, Headington, Oxford. More information on page 223.

ICSU Year Book 1988

This is the year book of the International Council of Scientific Unions. It includes names and addresses and other important information on ICSU's international scientific unions (of which IUPAC is one), national members, associates and observers, scientific associates, scientific committees and commissions and ICSU bank accounts.

The book is edited by F. W. G. Baker, A. Clayson and S. Orsoni and published by the ICSU Press for ICSU, 51 Bd de Montmorency, 75016 Paris, France.

Clinical chemistry position papers

The following two position papers have been published by the International Federation of Clinical Chemistry (IFCC):

- Position paper on the role of molecular biology techniques in clinical chemistry, prepared by C. Wagener and H. Greiling.
- Position paper on rational use of clinical laboratory data, prepared by Erik Magid.

Copies of the papers can be obtained from IFCC Technical Secretariat, Box 986, Emdrupvej 72, DK-2400 Copenhagen NV, Denmark. Comments on the papers are required by 1 January 1989.

Letter to the Editor

Atomic weights and the width of my desk

Sir,

I had always thought that the atomic weight of oxygen was 16.00 g/mol and that my desk was 1.56 m wide. However, on page 94 in the May issue of *Chemistry International* it is stated that atomic weights are "scaled relative to the isotope ^{12}C taken as 12 exactly. Atomic weights are, therefore, dimensionless numbers numerically equal to the molar masses of the elements expressed in grams per mole." By the same reasoning the width of my desk is scaled relative to some fraction of the distance between Paris and the North Pole, or relative to the distance between two scratch marks on a metal bar in Sèvres, or relative to some multiple of the wavelength of a spectral line. So I suppose my desk width is also a dimensionless number. That is very handy if I ever want to take a logarithm of it, but very confusing to students trying to do dimensional analyses of problems.

Sidney Toby
Affiliate Member
Rutgers University
New Jersey, USA

A typical day in the life of a terminologist

Dr Helmi Sonneveld

Dr Helmi Sonneveld is a member of the Subcommittee on Surface Analysis of the Commission on Microchemical Techniques and Surface Analysis. In 1987, she started a terminology bureau called "Topterm" in Amsterdam, Netherlands. In this article she outlines her work on terminology and describes a typical day in her life.

Writing an article for *Chemistry International* titled "A typical day in the life of a terminologist" is not exactly what I had in mind when I decided to resign from the Department of Linguistics of the Vrije Universiteit in Amsterdam, where I had been teaching terminology theory and practice for 18 months, in order to start my own commercial terminology bureau. I guess this means that situations may change even faster than one would have thought possible.

I became acquainted with the ins and outs of terminology three years ago, when it was not yet defined as a separate discipline. Translators did their own terminological research, sometimes without the reference and coordination service necessary to centralize and standardize the terminology. Nevertheless, judging from activities within various companies, it seemed that standardization of terms, at least within the realm of the company itself (Unilever, Akzo, Shell, DSM) was wanted.

Terminology is now gradually being recognized as an integral part of the translation process. It is defined as the art of identifying, analysing and, where necessary, creating the vocabulary for a given technology in a specific work situation, in order to respond to the communication needs of the user. Terminology may be unilingual, bilingual or multilingual. With the increasing complexity of

technical translation, terminology has finally emerged as an independent discipline.

The terminologist's duties

The above suggests that terminology work is mainly concerned with translation activities. For a large part, this is true. A terminologist's duties are mainly concentrated in four main areas of activity: terminology, documentation, consultation and liaison with translators and interpreters; four areas in which my own bureau specializes.

These duties consist primarily in carrying out subject-field and term research in response to the needs of various clients such as translators, interpreters, writers and in some cases specialists. The research involves preparing indexes, glossaries, vocabularies, terminological studies and bulletins, primarily through the use of data processing equipment.

"A terminologist's duties are mainly concentrated in four main areas of activity: terminology, documentation, consultation and liaison with translators and interpreters."

This, of course, does not yet answer the question why I had not expected to be writing an article for *Chemistry International* only seven months after my start as an entrepreneur. Terminology work still is in many ways a relatively unknown discipline. Much work needs to be done in order to explain not only to translators and interpreters, but also to subject specialists why the constant and rapid growth of terminological innovations and the increasing flow of information create a need for clear and unambiguous terminology.

As the subject fields, in science as elsewhere, expand into new areas, new terms are needed to describe new realities. Thus, the terminology of subject fields, such as chemistry, is not static. Consequently it must evolve in pace with the advancement of techniques and innovation.

In all professional training, whatever the level, the terminology of the appropriate special field is employed, and acquired either consciously or unconsciously with the mother tongue. There are at present very few centres for professional training in the Netherlands which offer an integrated terminology component of any kind. By training in the methods and principles of terminology, experts will come to perceive the position of their own area of specialty in relation to other areas, and through their appreciation of the problems they will be able to make a much more valuable contribution to any terminological activity, for instance standardization[1].

Since, as I have already stated, terminology work is not yet a generally known discipline and since its principles and methods are not yet recognized throughout the various specialized areas, I was especially pleased to find that much important work in the field of terminology is being done within the International Union of Pure and Applied Chemistry[2].

I was asked by the "Working Group on Surface Analysis" (Commission V2 — Microchemical Techniques and Trace Analysis) to propose a comprehensive list of terms and definitions of terms for use in surface analysis. In its final approved form this list will be recommended by IUPAC for international use. As such, the contents will find their way into the specialist literature and eventually into national and international standards. As I understand it, this task is the first instance within IUPAC of a collaborative effort between terminologists and scientists.

The subject field of chemistry has a large vocabulary, and its language grows as the science grows. New terms are needed and coined constantly for new compounds, new reactions, new concepts, and new methodology. Terminological principles and methods can be of benefit to the language of chemistry. It is a pleasure for me to be able to say that through my work on the Surface Analysis Project I have come to realize that a look at chemical nomenclature can contribute to the development of the science of terminology[3].

Thus, although terminology may not yet have reached world-wide recognition, here I am, one of the first terminologists in the world managing a commercial terminology bureau and working on a team composed of terminologists and scientists and actually writing an article about myself for *Chemistry International*. This is not a new development that will shake the world, but it may help to bring together experts from two different disciplines in order to develop new insights into the possibilities and difficulties of two, up to now unrelated, subject fields.

On 24 June 1988, Topterm organized a symposium titled "Chemical Nomenclature and Terminological Science: A useful blending of two disciplines". For the first time, chemists were introduced to the methods, principles and practical possibilities of terminology and terminography (the recording, processing and presentation of terminological data acquired by terminological research), and terminologists were exposed to terminological problems in the chemical field.

A typical day

A typical day in the life of a terminologist generally consists of unravelling threads and winding them

Helmi Sonneveld leaves *Amsterdams Ondernemers-centrum* (Amsterdam Entrepreneurs Centre). Sonneveld is Director of the terminology bureau "Topterm" — a new business which she started in September 1987. Her office is located in the Entrepreneurs Centre.

into a handy, neatly arranged ball. The IUPAC Surface Analysis Project is one of the most time-consuming activities at the moment. It is amazing how much time even the arrangement of a relatively small number of terms takes. This is the reason why many translators, translation-departments or scientists do not find the time to work in detail on the preparation of systematically ordered terminologies.

Terminology work is therefore necessarily teamwork. Not only because terminologists need the expertise of the subject specialists of the discipline in question, of computer-experts and documentalists, but especially because of the fact that terminology-work is extremely time consuming, in spite of the fact that nowadays most of the work has been computerized.

Preparing a terminological monolingual vocabulary in general comprises the following activities[4]. First, the terminologist has to limit the problem as much as possible, that is s/he has to define the field of study. This is an extremely important part of the work, as working with words may easily lure you into an inconquerable swamp of data from which you may not be able to return.

Limiting the problem usually involves providing a name for the field of study as well as defining in detail its subdivisions that are to be included in the vocabulary and the related fields that are to be left out. A decision should also be made concerning the approximate number of concepts that the vocabulary will contain. The size of a vocabulary can vary considerably according to whether highly specialized concepts are included or not.

As I pointed out earlier, the preparation of voluminous vocabularies usually takes so much time that they are either never completed, or are out of date when they do appear. It is therefore important not to exceed a limited number of terms per volume. It is found, moreover, that specialists are interested in the terminology of their own particular fields and have little use of extensive and less specialized vocabularies.

The first stage also includes making decisions about the languages involved (in case of a multilingual vocabulary) and the form and layout of the vocabulary. Then, the terminologist needs to consult various sources of information. The most important sources that may be used are the national and international standards and recommendations, as for example in the case of my Surface Analysis Project, the *Dictionary of Terms for Vacuum Science and Technology*, *Surface Science*, *Thin Film Technology*, *Vacuum Metallurgy*, published for the American Vacuum Society by the American Institute of Physics; ASTM (American Society for Testing and Materials) — E42 Definitions, combined list of terms relating to surface analysis; ASTM Designation E 673 — 86 Standard definitions of terms relating to surface analysis; and the IUPAC *Compendium of Chemical Terminology, IUPAC Recommendations*, prepared by Victor Gold,

Kurt L. Loening, Alan D. McNaught and Pamil Sehmi.

The next task is one of the most difficult of the entire process. Based on the collected documentation, a (provisional) schedule of concepts will have to be drafted of all the concepts that should appear in the vocabulary. This procedure is fundamentally different from the lexicographical approach in which in most cases the alphabetical system is applied.

The schedule of concepts provides the user of the vocabulary with an overview of the concepts described in the vocabulary, and their relationships. The information resulting from this schedule of concepts enables the terminologist to make adequate decisions concerning undesirable synonymy, homonymy, polysemy as well as incorrect term formations, definitions, and so on.

The actual dictionary may be ordered either systematically (based on the schedule of concepts) or alphabetically. However, in either case, the schedule of concepts lies at its basis. The systematic vocabulary is provided with alphabetical indexes. The preparation of the alphabetical lists forms the last stage of the terminological procedure.

The stages described above may take up several months of intensive, detailed work. It is therefore probably not surprising that doing jigsaw puzzles or crosswords is not my favourite way of passing my spare time. Managing my bureau takes up, besides the work on the preparation of the vocabularies, most of my days' work.

This work includes all the usual things, such as keeping my administration up to date, making business appointments, writing articles for magazines, reading specialist literature, etcetera. Furthermore, I try to keep in touch with the developments in the field of terminology in the Dutch universities. I spend quite some time helping students to write their theses. Once a teacher always a teacher they say. It's one of the things I like best about my work.

Of course I also take trouble to keep up with developments abroad. Much work in the field of terminology research is being done in Canada, Austria, UK, Belgium and in both the FRG and GDR. I could easily spend my entire year visiting congresses, symposia, and other meetings devoted to translation problems, lexicological methods and terminological principles.

When I actually decide to attend a conference I try to make the most of it, which means talking to as many colleagues as possible, visiting as many important places as possible and having as much fun as possible. In this way attending conferences is as much relaxation as it is work.

Winding up this little overview of a terminologist's routine, I need to stress the fact that I am convinced that terminological work, although many may think it a subject field intended exclusively for purists and language idealists, in the coming years will become more and more important, especially since the progress of the transnationalization of terms and the rapidly developing scientific and professional terminology favourably condition the development of systematic unambiguous and authoritative vocabularies.

Scientific achievements are a common property of all the peoples in the world, but in order to make them universally accessible, it is necessary to create collections of terms (preferably in all national languages) with the help of universally acknowledged methods and principles, so that science will become more and more accessible to all nations.

International use of standardized terminological procedures not only facilitates the task of translators, scientists and documentalists, but also promotes understanding between peoples and cooperation among nations by facilitating the dissemination of scientific, technical and literary works across linguistic frontiers. It also ensures a faster exchange of scientific information, and accelerates the development of economy and culture in global terms.

Although the importance of cooperation between terminologists and scientists is not yet universally acknowledged, I am very pleased to have been enabled to write this article about my work and also a little bit about myself in a magazine that is not dedicated to linguistics in any sort of way. Several months ago I thought that cooperation between scientists and linguists in general would be a long time away. I am glad that experience proved me wrong.

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Secretary General's Column

Prof. Tom West

Secretary General Prof. Tom West reports on the Executive Committee meeting held in Moscow in May. He also makes a plea to affiliate members to keep in touch with IUPAC and to recruit other affiliates.

In the previous column in this series (see *CI*, Vol. 10, No. 2, p. 57) I reported on events at the general assembly of the union in Boston, Massachusetts in August 1987 and some decisions taken there.

The general assembly is the occasion when all the scientific commissions meet biennially on a regular basis, frequently hold inter-commission meetings, and report their progress and plans to their division committees.

The governing body of the union is the Council, which is composed of the delegates of the national adhering organizations. It deliberates on policy matters; receives the reports of the division presidents and of the chairmen of the standing committees; decides on the budget and hence the level of activity of the union; elects the officers of the union and the members of the Bureau; and generally regulates the affairs of the union.

The Bureau currently consists of 11 members elected by Council, 8 division/section presidents, the 4 officers of the union, the immediate past-president plus the chairmen of the CHEMRAWN (Chemical Research Applied to World Needs) Committee and COCI (Committee on Chemistry and Industry). The Bureau meets every year. In 1988 the meeting took place in Oxford in September.

The Bureau acts on behalf of the Council between general assemblies and makes recommendations to it on matters on which the Council itself must decide. The Bureau in turn elects three of its members to serve with the officers and the immediate past-president on its Executive Committee. The latter meets annually some months before the Bureau to discuss IUPAC business and to take any necessary actions on behalf of the Bureau before its next meeting.

May-days in Moscow

It is on the 1988 spring meeting of the Executive Committee that I now report. The meeting was held by invitation of the Academy of Sciences of the USSR at the Academy Presidium in Moscow on 16–17 May.

Afterwards the committee members were invited to Novosibirsk Akademgorodok as the guests of President Valentin Koptyug and the academy where they visited some of the many institutes of the academy. They also heard of the exciting topics being researched there.

Academician Koptyug is vice-president of the academy and president of the Siberian Division of the Academy of Sciences of the USSR. It is a pleasure to record here the thanks of the Executive Committee members to the academy for the excellent arrangements made for us and for the wonderful hospitality extended in Moscow and Novosibirsk.

Readers of this column will, I hope, understand that I am able to comment on only some of the many topics discussed by the Executive Committee meeting. This is because there was so much business and also some topics must remain confidential until they have been discussed by the Bureau and, in some instances, by the Council.

Perestroika, IUPAC-style

The sub-heading here may be somewhat misleading because the restructuring being discussed by the Executive Committee at Moscow related, of course, only to IUPAC. It goes back to earlier discussions — and indeed a special meeting of the Bureau at the Boston general assembly under the chairmanship of the then president, Ram Rao of India. The question was then raised whether or not IUPAC had a structure appropriate to the changing needs of modern-day chemistry.

The Executive Committee discusses the initial reports of the divisional forward planning groups.

In Moscow, the Executive Committee had before it the initial reports of the divisional forward planning groups, which had been set up at Boston with briefs:

(i) to suggest what new areas of activity might be undertaken by each division in future and what interdisciplinary matters might be involved;
(ii) to consider which long-term commissions might be dissolved to allow such new activities to be undertaken by short-term working groups.

Several ideas on possible new directions were forthcoming in the division reports but, not too surprisingly perhaps, there were few proposals for the dissolution of existing commissions. Whether the lack of such proposals was because the divisional groups thought it was too early to go this far, or whether they felt that their new ideas could not be sufficiently well tackled by short-term working groups, was not clear.

However, the Executive Committee thought it appropriate for all division presidents to see all the reports thus, for their better information, and to ask them to explore matters further in respect of the original briefs in time for the Bureau meeting in September.

Dr Zoya Samoylova outside the Presidium of the Academy of Sciences of the USSR. Samoylova, who is Scientific Secretary, National Committee of Soviet Chemists, was responsible for local arrangements for the Executive Committee meeting. She is also USSR National Affiliate Membership Secretary.

The role of division president is not an easy one! Be that as it may, however, the discussion on possible restructuring will continue with growing momentum, or inertia as the case may be, at the Bureau's next meeting and again at the Lund general assembly in August 1989.

Prescription for medicinal chemistry

Another decision made in Boston that was taken further by the Executive Committee in Moscow, related to the setting up of a Section on Medicinal Chemistry. I should explain here, perhaps, that a section is similar in standing to a division, but has usually more limited objectives at the outset and works without commissions in the first instance, though it can set up working parties. Its president is automatically a full member of the Bureau and, like the division presidents, reports directly to Council at the general assembly.

In Boston, the Bureau had some problems with the programme proposed by the, then provisional, section committee, but these were resolved and a limited programme was approved. IUPAC Vice-President Yves Jeannin (France) was charged with chairing a small group to establish the new section committee. The Executive Committee approved recommendations of the vice-president's group to appoint as the officers of the section — Prof. C. G. Wermuth, France (President), Dr B. Metcalf, USA (Vice-President) and Dr N. Koga, Japan (Secretary) and to give them terms of reference for the new section and guidelines for the election of three ordinary members of the section committee, which will thus be enabled to meet at the general assembly in Lund and possibly before then.

The main thrust of the new Section on Medicinal Chemistry in its initial stages will be:

(i) to identify areas of chemistry related to medicine, such as the discovery, study and development of drugs and other active compounds, where there is a clear need for more scientific information, experimental data and theory;
(ii) to facilitate the application of chemistry to medical science by promoting cooperation between chemists and medical scientists, for example, by studying topics of international importance which, from a scientific viewpoint, need standardization, codification or regulation; additionally, from the viewpoint of the needs of mankind, particularly to consider such matters in relation to developing countries;
(iii) to cooperate with other international organizations which deal with matters relating to chemistry applied to medicine;
(iv) to contribute to the advancement of all aspects of chemistry applied to medicine.

Biological chemistry under the microscope

The union is becoming increasingly interested in the impact of chemistry on the biological sciences and vice versa. To this end the Bureau has set up a working party, under the Chairmanship of Prof. Ingemar Wadsö (Sweden) involving Dr P. C. Kearney (USA) and Prof. N. Montalbetti (Italy), to study matters relating to IUPAC's future role in the area of biological chemistry and to report back to it in September.

Executive Committee members take a welcome break from their meeting and visit Red Square (above) and the Kremlin (right).

The initial report from Prof. Wadsö to the Executive Committee related to a survey of relevant work going on in various commissions of IUPAC, and consultations with the International Unions of Biochemistry and of Pure and Applied Biophysics. The developments in this area are likely to be rather interesting and, together with the emergence of work on medicinal chemistry and then on clinical chemistry (Division VII), may be significant in relation to the ongoing discussions on the structure of IUPAC.

CHEMRAWN and the air we breathe

The CHEMRAWN Committee held a stocktaking meeting in March to consider recent progress in arranging its now world famous series of conferences and to discuss plans for proposed meetings on world food supplies and on atmospheric chemistry.

It continued to look forward to a possible 2nd World Conference on Food Supplies, possibly in India in 1992. Meanwhile, a working party has been set up to explore arranging a CHEMRAWN Conference on Atmospheric Chemistry, covering topics such as CO_2 levels in the atmosphere and the greenhouse effect, chlorofluorocarbons and the ozone layer, acidic deposition and so on. The participation of members of the Committee on Chemistry and Industry (COCI) in the formative stages of the programme planning was urged. Plans for a conference on water supplies were held in reserve.

Clearly the CHEMRAWN Committee is continuing the tradition of turning its attention to the role of chemistry in relation to the world's most pressing needs. It is to be hoped that, in these areas of planned activity, world governmental authorities will pay similar attention to the recommendations that emerge as they did with earlier CHEMRAWN conferences.

Hotel Ukraine (left) where Executive Committee members stayed in Moscow.

COCI tackles safety in chemical production

COCI itself is well advanced in planning its first conference on "Safety in Chemical Production" to be held in Basel, Switzerland, 10–14 September 1990. The main topics will be risk assessment, risk reduction and education at university level as well as in industry in relation to safety in the production of chemicals.

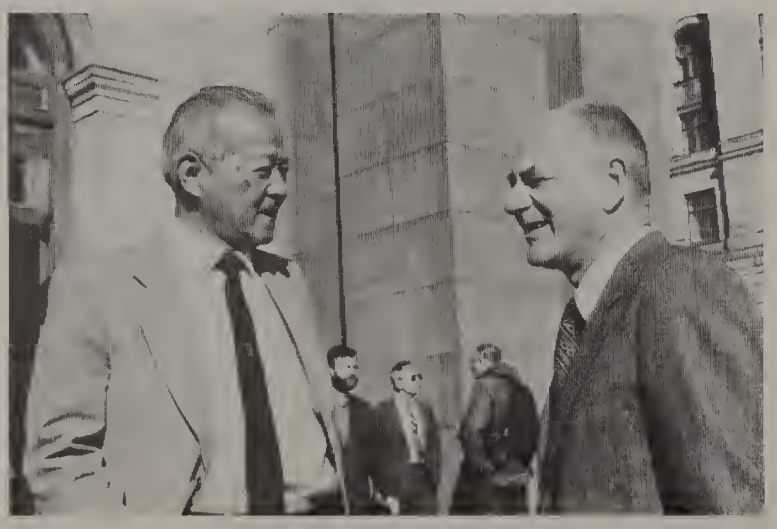
Participation from most major chemical manufacturers and government agencies in advanced countries is envisaged and equally importantly from many developing countries with subvention from industry, government and scientific institutions.

There was strong support for these plans of COCI from the Executive Committee and a welcome that this difficult and emotive issue was being tackled by the union's company associates via COCI. A successful outcome to these plans by COCI should certainly improve the image of chemistry in the eyes of a generally critical and apprehensive world public, which gives little or no credit to chemistry and chemists for the innumerable benefits and high standards of living, welfare and health it enjoys as a result of our work, but is quick to condemn us out of hand whenever an accident occurs.

Affiliate members, where are you?

In 1986, when the affiliate membership scheme was initiated, 5587 affiliates enrolled by the end of the year. This was thought to be an encouraging start. In 1987, when more countries were able to set up local arrangements, the numbers rose to 7856.

This year, by mid-April, the number of enrolled affiliates was 7488. This seems to indicate that a state of equilibrium has been reached rather sooner than was anticipated. One factor in this situation is undoubtedly the increase in the IUPAC component of the membership subscriptions levied by individual national adhering organizations (NAOs) or their contractor chemical



Executive Committee members Prof. Shô Itô (left) and Vice-President Yves Jeannin hold informal discussions outside Hotel Ukraine.

The CHEMRAWN Committee meeting in London, March 1988. A full report on CHEMRAWN activities and this meeting was published in the September 1988 issue of *CI*.

societies. The union had to raise this from USD 7.50 to USD 12.00 for the biennium 1988–9 because of the increased costs of publication and distribution which had arisen since the scheme was first costed in 1984–5.

In several cases, the NAOs/chemical societies, probably also had to increase their overheads and distribution costs for *CI*. The decrease in the value of the US-dollar and the absence of a recruiting/publicity drive in 1987–8 were other factors. Plans are now being made to undertake another publicity drive. Ideally, however, we would like to have a minimum affiliate membership of 10 000.

Prior to 1986, there was no way in which chemists could voluntarily become associated with the international scientific union that represents their affairs world-wide and the number of countries involved in any way with IUPAC was only about 40. Now there are 97 countries involved and, together with the members of the commissions, divisions, standing committees and so on, there is an involvement of some 9000 chemists in IUPAC.

Miss Ann Troughton, IUPAC Deputy Executive Secretary, who was responsible for compiling the *IUPAC Handbook 1987–89*. Affiliates are entitled to the handbook at a concessionary price of USD 16.00.

"As Secretary General, I would like to ask each affiliate to make a serious attempt to recruit at least one other new member in support of IUPAC and for the good of chemistry as a whole."

Whilst this is a very considerable improvement on the situation prior to 1986, it still leaves much to be desired when compared to the International Union of Astronomy, for example, where 5000 astronomers are involved. There are many more chemists than astronomers! IUPAC should do much better than at present. There is a great need for the Council to take up this challenge, but up to the present it has been exceedingly cautious in relation to affiliate matters. As an affiliate, why not express your views; it is your right to do so.

As Secretary General, I would like to ask each affiliate to make a serious attempt to recruit at least one other new member in support of the union and for the good of chemistry as a whole.

Meanwhile, many of us would like to hear a lot more from affiliates in the correspondence column on the affairs of IUPAC and more generally in relation to your views on its future activities.

I was particularly pleased to see the letter from Affiliate Mervyn Richardson (*CI*, Vol. 10, No. 2, p. 49) on the idea of an IUPAC "priority pollutant list" promulgated by the Water Chemistry Commission of the Applied Chemistry Division. This is exactly the type of feedback and comment that we need from our affiliates. On behalf of the commissions, divisions and standing committees, I urge all affiliates to use their links with the union and write to us with their ideas on our existing programmes and for new ones that might be pursued by the union.

In this connection, a list of the officers for all IUPAC bodies for the years 1987–9 was published in the November 1987 issue of *CI*. In addition, those of you who have the special supplement to *CI* published in September 1986 (the so-called *Handbook for 1985–7*) will be aware of the current programmes for that biennium (pages 126–178).

The handbook has now been separated from *CI* and will no longer be sent free of charge to affiliates. However, the 1987–9 edition can be bought at a concessionary price of USD 12.50 by any affiliate from our official publisher Blackwell Scientific Publications. Perhaps it might be worthwhile to issue a special edition of *CI* once every two years, containing only the current programmes, instead of a regular issue if this has the support of a sufficient number of affiliates. We would certainly like to know.

So, why not pick up your pens, word processors or whatever, and write to the Affiliate Membership Secretary, Dr Mike Freemantle, or myself at the correspondence address given inside the front cover of this issue of *CI*.

We would be delighted to hear from you on this or any other matter related to our union. Given sufficient support we could have a regular affiliate affairs page. There is only one thing more interesting than a letter from someone and that is to meet the writer. Where are you affiliates? Let's hear from you!

Commission & Committee News

Clinical Chemistry Division prepares information booklet

The Clinical Chemistry Division Executive Committee met in Bayreuth, FRG from 7–8 May following the 3rd International Symposium on Biological Reference Materials. The meeting was preceded by an informal discussion among the officers of the division.

The committee considered the projects of the division's commissions; methods of developing the division's working efficiency; and the future directions of the division's work.

Since the Boston General Assembly, the Commissions on Quantities and Units (VII.2) and Teaching (VII.3) have made good progress with several projects. It is specially necessary for Commission VII.3, which will be terminated at the end of 1988, to implement a strict timetable for handling the publication of its projects.

New guidelines will be prepared by division officers on the refereeing and approval system for divisional nomenclature and non-nomenclature publications. Continuing efforts will be made to achieve the best use of the expertise of division members at the divisional level. The *Division Information Booklet*, currently in preparation, is intended to explain clearly the roles and responsibilities of division members, and to be of help to the division's new recruits. The booklet will also include general information on the structure and functions of IUPAC.

In accordance with the report of the Division Think-Tank, and depending upon the IUPAC Officers' response, it is desirable that the future work of the commissions should be oriented towards two facets of clinical chemistry:

(i) methodology and standardization ('tools')
(ii) biological applications of the developed tools,

with emphasis on chemical safety, other aspects of preventive medicine, and the laboratory needs of ambulatory care.

To strengthen the roles and working capacities of the division officers, it is desirable to consider how the experience of the past-president could be better used in supporting the division's work. The best solution might be to extend the length of service of the past-president to the full period between general assemblies at which the division president is elected.

The arrangements and timetables of the division's meetings at the Lund General Assembly were agreed. The next meeting of the Division Executive Committee will be held during the 35th IUPAC General Assembly, Lund, Sweden, 8–9 August 1989.

Jorma Järvisalo

Electroanalytical chemistry

Sixteen members and four observers were present at the meeting on the Commission on Electroanalytical Chemistry (V.5) held 22–25 August 1987 during the Boston General Assembly.

The commission reviewed current projects. The following five reports were approved for publication in *PAC*:

- Thermodynamic constants for individual ionic species — IV, V
- Electroanalytical chemistry of sulfur compounds in new coal conversion technologies
- pH scales in non-aqueous and mixed solvents
- Purification of solvents and tests for impurities
- Evaluation of standard potentials from emf data in non-aqueous and mixed solvents by extrapolation.

The projects on "Standard systems for heterogeneous charge transfer rates" and "Critical comparison between various carbon indicator electrodes in voltammetry" were dropped. Six other projects are to be completed or reviewed at the next commission meeting. Publication of a collected volume on "Purification of solvents and tests for impurities" is to be accelerated.

Twelve new projects, of which eight had been proposed at the 1986 Milan meeting, were discussed and forwarded to the Division Committee for approval. The topics of these new projects are: voltammetric microelectrodes; sensitivity of anodic stripping voltammetry; adsorption in pulse polarography; polyelectrolysis; oxide reference electrodes; pH measurement in non-aqueous and mixed solvents; bioelectroanalysis and biosensors; chemometrics in electroanalytical chemistry; oscillographic titrations; static mercury drop electrodes; piezoelectrical crystal microbalance; and calibration of ion-selective electrodes.

Projects of the Subcommittee on Electroanalytical Methods of Environmental Trace Analysis were reviewed in detail. The following three

reports were approved to be forwarded to the Division Committee:

- Application of ion chromatography to the determination of airborne pollutants
- Interpretation of voltammetric speciation measurements without sample pretreatment, case study: polarographic determination of Fe(II), Mn(II) and S(−II) in anoxic waters
- The determination of pH in highly saline nature waters.

One project was dropped and four are continued. The following three new projects, which were proposed at the 1986 Milan meeting, were discussed and forwarded to the Division Committee for approval: voltammetry in low ionic strength solutions; determination of pH in acid rain; and membrane filtration problems.

The commission felt that the scope of activities of the subcommittee should extend beyond that of the commission's activities. Accordingly, the Division Committee has created a new Subcommittee on Environmental Analytical Chemistry under the chairmanship of Prof. J. Buffle (see *CI*, Vol. 10, No. 3, pp. 110–111).

Mitsugi Senda

Nomenclature of Organic Chemistry

A major effort of the Commission on Nomenclature of Organic Chemistry (CNOC) continues to be the revision of the 1979 edition of *Nomenclature of Organic Chemistry*. In Boston, Part I, which will give the basic principles for deriving unambiguous, although not necessarily unique, names was reviewed thoroughly. It should be ready to begin the review process this year.

An appendix to Part I will list all of the trivial and semisystematic names to be retained in the new edition. Three classes of such names have been identified: (1) those fully substitutable; (2) those for which only limited substitution is permitted; and (3) those for which no substitution will be allowed. One of the more important and also one of the most difficult tasks for the Commission is to decide just which trivial and semisystematic names to recommend and in which category each should be placed. Such considerations occupied a considerable amount of time in Boston.

Part I of the new edition will contain comprehensive recommendations on several subject areas as well as the necessary hierarchical rules for deriving a unique name for each organic structure. Comprehensive recommendations in several areas were reviewed in Boston. Recommendations for naming radicals, ions, radical-ions, and related compounds are ready to begin the review process. Recommendations for naming fused and bridged ring systems and natural products and related compounds are well advanced.

Glossaries of class names and stereochemical terminology are being compiled, both of which were reviewed thoroughly in Boston.

Warren Powell

Address changes

Dr Joyce L. Beare-Rogers (Chairman, Commission on Oils, Fats and Derivatives). Fax: +1 (613) 957 1907.

Prof. D. H. Busch (Chairman, Commission on Nomenclature of Inorganic Chemistry). Department of Chemistry, University of Kansas, Malott Hall, Lawrence, Kansas 66045, USA.

Dr N. Koga (Secretary, Section on Medicinal Chemistry). Daiichi Seiyaku Co. Ltd, 14–10 Nihonbashi 3-chome, Chuo-ku, Tokyo, 103 Japan. Tel: +81 (3) 272 0611, Telex: 22729 ARSEMIN J. Fax: +81 (3) 272 6898.

Prof. N. J. Leonard (Secretary, Organic Chemistry Division). Fax: +1 (217) 244 8068.

Dr T. R. Roberts (Secretary, Commission on Agrochemicals). Tel: +44 (795) 412649.

Prof. P. A. S. Smith (Chairman, Commission on Nomenclature of Organic Chemistry). Fax: +1 (313) 936 7787.

New use for glass fibre

The shark referred to in the report on page 212 is, in fact, a glass fibre sculpture. Its owner claims that the shark is a work of art. Work of art or not, the shark has aroused a lot of interest — and controversy — in Oxford. It also demonstrates what a versatile material glass fibre is.

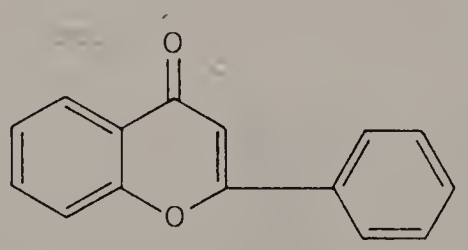
PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Larval growth inhibitors

Although flavonoids (I) have been known to exist in plants as long as alkaloids, by comparison, their pharmacological effects and potential medicinal uses have attracted little attention. Alkaloids often are toxic and their profound physiological properties were known and explored by man even before they were isolated and their structure elucidated. By contrast, the flavonoids are not poisonous and, as dietary ingredients, may sometimes be beneficial.

Perhaps another reason for the neglect of the flavonoids was the controversial proposal, in 1936, that citrus bioflavonoids was an essential vitamin, Vitamin-P. The result of the unfavourable publicity that followed this unfounded claim probably discouraged further medical experiments at the time.



The interest in flavonoids has increased in the last decade, especially as a pharmacologic agent having significant activity in a variety of systems. Some plant flavonoids affect insect behaviour, development and growth. Others are responsible for resistance of plants to insect attack. Flavones, glycosides and aglycones in the cotton plant are larval growth inhibitors for *Heliothis Zea, Heliothis virescens* Fabricius, and *Pectinophora gossypiella* Saunders. Flavonoid polymers are insect resistance factors of oak tree, and corn plant.

Elliger *et al.* analysed a group of 42 flavonoids for antigrowth activity toward *H. Zea*, and evaluated them with respect to structural features affecting activity. They found that, in general, an adjacent (ortho) substitution of phenolic hydroxyl groups was necessary for inhibitory activity. However, the fact that the absence of ortho-hydroxylation does not imply lack of activity could not be explained. Moreover, vicinal hydroxylation alone is not sufficient to produce activity. The analysis presented by Elliger *et al.* was purely empirical and qualitative and was based on a simple examination of the database. It does not provide much insight into possible quantitative relationships that may exist between structure and activity.

Gilles Klopman and Ruben E. Venegas at Case Western Reserve University, USA have successfully applied their Computer Automated Structure Evaluation (CASE) program to a large number of biological systems. They felt that it could provide some insight into the database presented by Elliger and others and help identify the features that are responsible for the antigrowth activity of flavonoid derivatives in the *H. Zea* system.

Their paper on "Computer automated structure evaluation (CASE) of flavonoids as larval growth inhibitors" was published in the February issue of *PAC* (pp. 265–270). The paper was one of a number of invited lectures presented at the World Congress of Theoretical Organic Chemistry held in Budapest, Hungary, 12–19 August 1987.

Relativistic effects in atoms and molecules

Another paper published in the February issue of *PAC* (pp. 167–173) and presented at the congress was concerned with the "Application of configuration interaction (CI) for the study of relativistic effects in atoms and molecules". The paper was by Robert J. Buenker (Bergische Universität, FRG) and Praphull Chandra (Banaras Hindu University, India).

Over the past two decades there has been much progress in developing computational methods which describe the electronic structure of atoms and molecules. These techniques generally employ basis set expansions and correspond to an approximate solution of the non-relativistic electronic Schrödinger equation at either the self-consistent field (SCF) or configuration interaction (CI) levels of treatment.

The use of a purely electrostatic Hamiltonian has the drawback of being incapable of describing a number of relativistic effects, including various types of zero-field splittings which become increasingly important for systems whose constituent atoms come from the second and higher rows of

the periodic table. The most successful approach to including such relativistic effects in the theoretical treatment involves the solution of the Dirac equation, but its use of four-component spinors instead of the two-component basis functions of the Schrödinger equation poses significant obstacles which preclude a straightforward extension of the above non-relativistic SCF and CI computational methods beyond the level of an electrostatic Hamiltonian.

To preserve the two-component structure to a maximum extent in a relativistic treatment, various reductions of the Dirac equation have been proposed, which in effect provide a more comprehensive Hamiltonian operator containing the spin–orbit, spin–spin, orbit–orbit and other relativistic potential interactions as well as a correction to the kinetic energy. Because these terms vary as r^{-3} or p^4 it is not possible to treat them in a strictly variational manner, since such a procedure inevitably results in the generation of unphysical charge distributions and total energies lying well below their experimental counterparts.

Essentially two approaches have been attempted to date to circumvent this difficulty and still retain as far as possible the two-component methodology of the SCF and CI computational techniques. The first of these, the Breit–Pauli method, simply treats the short-range operators to at most second order in perturbation theory, based on non-relativistic zero-order solutions of the Schrödinger equation, while the second involves the use of a somewhat altered version of the Breit–Pauli Hamiltonian which does afford itself to a variational treatment.

Both of these approaches were illustrated in the contribution by Buenker & Chandra who emphasized the manner in which the computational techniques of more conventional *ab initio* many-electron calculations need to be altered to obtain an optimal description of the desired relativistic effects of systems containing heavy atoms.

Accidents in nuclear reactors

A paper on "High temperature chemistry for the analyses of accidents in nuclear" was presented by Paul E. Potter (Harwell Laboratory, UK) at the 5th International Conference on High Temperature and Energy-related Materials held in Rome, Italy, 25–29 May 1987.

Potter described some of the demands which the analysis and prediction of the consequences of faults and accidents in nuclear reactor systems makes on our knowledge and understanding of the high temperature chemistry of the fuel and other materials.

He illustrated these demands by describing, for a Pressurized Water Reactor, the chemistry of the fuel clad gap, of the evolution of degradation of the core, and of the reaction between the material of the degraded core and concrete.

For a liquid metal cooled fast breeder nuclear reactor, he took examples from the chemistry of the reactions betwen liquid sodium and fuel, and aspects of the determination of the equation of state of the oxide fuel for temperatures up to about 5000 K.

Potter's paper and five other plenary lectures presented at the conference were published in the March 1988 issue of *PAC*.

Composites for high temperatures

The plenary lectures at the conference included a paper on "Composites for high temperatures" presented by E. Fitzer, Universität Karlsruhe, FRG.

The paper described materials which are reinforced by fibres, so-called fibre reinforced composites. Such tailorable composites are considered as the most promising candidates in future materials development, especially for application at elevated and up to highest temperatures.

The term "high temperatures" in the sense of Fitzer's paper covers the temperature range above the applicability of epoxies: from above 500 K up to more than 2500 K.

The paper considered the fibre materials commercially available today, and in development on the one hand and the matrix materials suitable for combination with the various fibre types on the other.

Fitzer also discussed the status of preparation of diffusion barriers, their influence on the basic carbon fibre properties and the limitations in application temperature because of limited barrier function.

He drew special attention to alternative fibres which can be used in metals, glasses, carbides and oxides due to their lower reactivity from the chemical viewpoint. Their disadvantage is a lower heat resistivity and most of them have also lower values for mechanical properties.

Finally, he presented the possibility of developing fibre reinforced composites from brittle matrix with non-brittle reinforcement fibres as an alternative challenge for high temperature material.

Polymer-supported organic reagents and catalysts

The March issue of *PAC* also contained invited lectures presented at the 30th Microsymposium on Macromolecules "Polymer-supported organic reagents and catalysts" held in Prague, Czechoslovakia, 6–9 July 1987.

These included a paper entitled "What is the real mechanism of polymer-supported phase-transfer catalysis?" by Frantisek Svec (Institute of Macro-

The analysis and prediction of the consequences of faults and accidents in nuclear reactor systems makes demands on our knowledge and understanding of the high temperature chemistry of the fuel and other materials. (*Photo courtesy Northeast Utilities, Connecticut, USA.*)

molecular Chemistry, Czechoslovak Academy of Sciences, Prague, Czechoslovakia).

In this paper Svec suggested a comprehensive mechanism for polymer-supported phase transfer catalysis. He explained the transport of organic reagents from the bulk phase through water to the catalyst particle in terms of emulsion polymerization.

The extraction equilibria were shown as a driving force for the change of surrounding solvents of active groups attached to the polymer. The oscillation of these groups between the organic solvent and water phase inside the polymer particle is the basic condition for the reaction. Svec produced experimental data to verify the theory.

Chiral polymer catalysts

A paper on "Chiral polymer catalysts in preparative organic chemistry" by M. Aglietto, E. Chiellini, S. D'Antone, G. Ruggeri and R. Solaro (Pisa University, Italy) was also presented at the micro-symposium.

The paper provided an up-to-date overview of the field of functional chiral polymers as catalysts in preparative organic chemistry. The authors focused attention on "metal-free" systems, that is, on polymeric systems capable of exerting their own specific catalytic role by virtue of the presence of active groups either directly bound to chiral residues or embedded in a chiral environment. The latter can be generated by chiral groups located along or within the polymer backbone, sometimes well away from the catalytic sites.

For convenience, the material was grouped into two major sections dealing with reactions carried out under homogeneous and heterogeneous conditions, respectively.

The first section contained a report on the activity of different catalysts as tested in the hydrolysis of chiral (optically active or racemic) activated esters. The second section referred to oxidative, reductive and nucleophilic additions to prochiral activated carbon–carbon or carbon–oxygen double bonds.

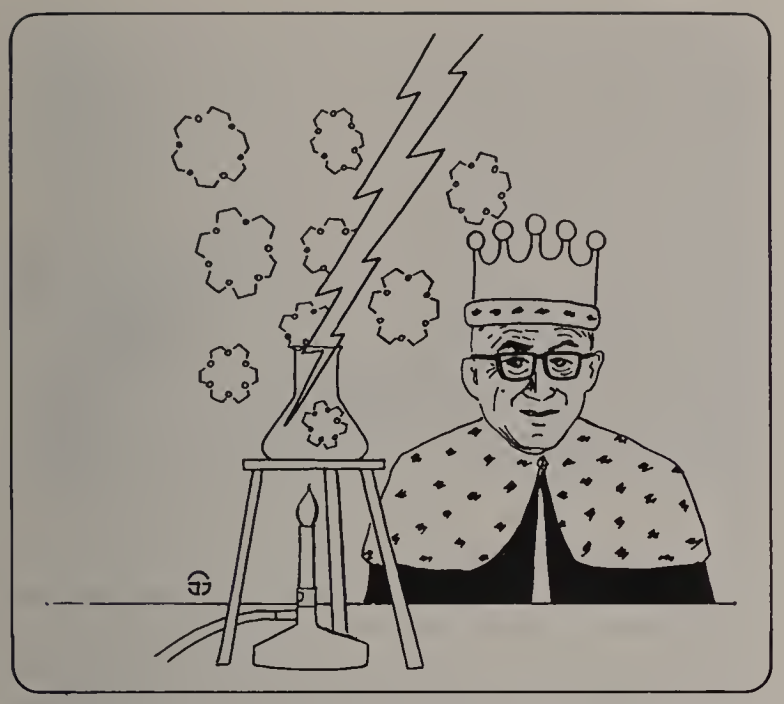
When the lightning struck

'We were then using vanadium in a coordination catalyst system for a very important polymerization wherein microstructure depended on vanadium ligands,' said Herman E. Schroeder — talking about Charles Pedersen's discovery of crown ethers. 'When polymerization was completed, we used an acid extraction to remove the vanadium residues from the elastomer since vanadium catalysed its oxidative degradation.

'So I asked him (Pedersen) if he would like to study the catalysts and also whether he could think of any substances from his earlier work with metal deactivators which might deactivate the vanadium so that the costly extraction would not be necessary.

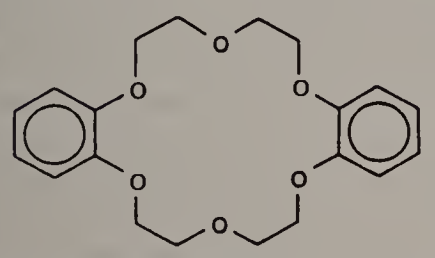
'Charlie jumped in enthusiastically. He suggested that it would be interesting to study polydentate oxy structures derived from various polyhydric phenols since these had not been examined.

'A few months later he told me that he enjoyed the catalyst ligand chemistry but that the various complexing agents all *enhanced* the pro-oxidative behaviour of vanadium except for tetrasalicylal pentaerythrityltetramine which was not practical



for manufacture. He also planned synthesis of a new pentadentate ligand for possible use as a catalyst. (It later turned out to be ineffective.)

'This is when the lightning struck! From one of his reactions he isolated the first of the crown ethers, what he later called dibenzo-18-crown-6.



Dibenzo-18-crown-6. This was the first crown ether isolated by Pedersen.

'Charlie first reported his research in 1967 in a paper in the *Journal of the American Chemical Society* which describes about 50 crown ethers with from 9- to 60-membered oligoether rings. This was an amazing accomplishment for a single chemist assisted by one technician.

'Reaction to Charlie's work was fast and enthusiastic. Now everyone wanted a talk or paper from him. The major impact of Pedersen's discovery is shown by the frequency of citation of his crown ether papers and even more strikingly by the many new directions of research it has opened up in which many groups have been engaged.

'As Prof. D. J. Cram described it:

> "Pedersen's discoveries illustrate organic synthesis and the organic chemist at their best. Using a simple Williamson ether synthetic procedure and simple starting material he synthesized in good yields a new family of cyclic polyethers.
>
> "He noted that these 'crown compounds' complex and lipophilize metal guest cations whose diameters are similar to the diameters of the host crown compounds. He attributed the good yields of the crown compounds in part to templating effects during the ring closures. He varied the ring sizes over a wide range by appropriate selection of starting materials and the orders in which the molecular parts are assembled.
>
> "The anions of salts lipophilized by the crown compounds have in many cases never been brought into non-polar organic media before, and show greatly enhanced reactivity over what they have shown in polar media.
>
> "Charles Pedersen's discovery of the crown compounds has had a major impact in a variety of investigative fields: inorganic chemistry (the crowns are ligand assemblies); organic chemistry (the crowns are commercial synthetic aids); physical organic chemistry (crown compounds greatly affect ion pair organization); biological chemistry (crowns are important ion transport agents); and analytical chemistry (analytic reagents and ion selective electrodes are based on crown compounds).
>
> "Pedersen's discoveries were not the usual result of the efforts of a group of competitors that he led or beat into print. Nor are they those of a large group of scientists under a director; they were his alone."'

The above description of Pedersen's discovery of crown ethers and the impact of his work is taken from a paper entitled "The productive scientific career of Charles J. Pedersen supplemented by an account of the discovery of crown ethers" presented by Herman E. Schroeder at the 12th International Symposium on Macrocyclic Chemistry held in Hiroshima, Japan, 20–23 July 1987.

The symposium commemorated the 20th anniversary of the announcement by Charles Pedersen of his discovery of the crown ether compounds

Charles Pedersen: His discovery of crown ethers was "an amazing accomplishment for a single chemist assisted by one technician".

in Japan at the 10th International Conference on Coordination Chemistry.

The plenary and session invited lectures (including Schroeder's) were published in the April 1988 issue of *PAC*.

Thermal plasma processing in the nineties

At the 8th International Symposium on Plasma Chemistry held in Tokyo, Japan, 31 August–4 September 1987, Prof. E. Pfender (University of Minnesota, USA) delivered a lecture on "Thermal plasma processing in the nineties".

He described the role which thermal plasma processing may play in the context of materials which are expected to be of major technical importance in the next decade. In the lecture, he referred to newer developments in plasma melting/remelting and plasma densification since these developments will carry over and expand in the nineties. He then went on to delineate the major research needs associated with these developments and concluded that some areas in thermal plasma processing will develop into viable technologies in the nineties.

Superconducting oxide films prepared by sputtering

In another paper presented at the symposium, Hideomi Koinuma (Tokyo University, Japan), reviewed recent studies on high-Tc superconducting oxide films especially emphasizing their preparation by sputtering. He compared and analysed the various methods in order to point out key factors and problems which must be taken into account for synthesis of the films.

Koinuma presented experimented details and results on the preparation of La–Sr–Cu–O and Yb–Ba–Cu–O films by 50 Hz ac sputtering. His team observed some features characteristic of the film preparation on ceramic substrates. They also noted epitaxial growth of single crystal Y–Ba–Cu–O films, since the anisotropic and high critical current density of the films is quite important not only for the application to electronic devices but also for the mechanistic studies of superconductivity.

Behaviour of NO_x in air-fed ozonizers

A paper by Dieter Braun, Ulrich Küchler and Gerhard Pietsch (Aachen University of Technology, FRG) described investigations on the influence of humidity, gas pressure, power density, and cooling temperature on NO_x formation. They compared experimental results with calculations based on a rate equation system of 75 chemical reactions and a considerably reduced system.

The importance of the different nitrogen oxides in ozonizers was discussed. While the N_2O concentration does not influence the ozone generation, the following equilibrium affects its formation via catalytic processes:

$$N_2O_5 \rightleftharpoons NO_2 + NO_3.$$

Plenary and invited lectures presented at the Tokyo symposium were published in the May 1988 issue of *PAC*.

Biotechnology in chemistry

The June 1988 issue of *PAC* included the four invited lectures presented at the symposium on "Biotechnology in chemistry: role in agriculture, chemical industry, pharmaceutical industry and energy and the environment". The symposium was held on 22 August 1987 during the 34th IUPAC General Assembly in Boston, USA (see p. 102, May 1988 issue of *CI*).

In the first paper "Applications of biotechnology to agricultural chemistry" Roy Chaleff (E. I. Du Pont & Co, USA) explained that short-term applications of biotechnology to agricultural chemistry will include modification of the responses of plants to the chemicals, identification of new target sites for chemical action, and the introduction of mechanisms for removing chemicals from the environment.

He presented the production of plants resistant to sulfonylurea herbicides as an example of the first two of these applications. Mutants of tobacco resistant to sulfonylurea herbicides were isolated by selection in cell culture. Biochemical studies of these plants identified acetolactate synthase (ALS), the first enzyme of the biosynthetic pathway for isoleucine, leucine, and valine, as the site of action of the sulfonylurea herbicides. Molecular cloning of the mutant form of the tobacco ALS gene will permit resistance to sulfonylurea herbicides to be transferred into a wide range of crop species.

Biotechnology in the chemical industry

The second paper at the symposium, presented by Heinz Kölbl (Bayer AG, FRG) was entitled "Biotechnology in the chemical industry". Kölbl, who is a titular member of the Commission on Biotechnology, pointed out that the stereospecificity and regiospecificity of biotechnological synthesis compares favourably with classical organic synthesis and is carried out by a biocatalyst.

However, there are limitations in many cases because of the sensitivity of biocatalysts to reaction conditions. The high cost of biocatalysts and problems associated with their regeneration as well as their use in non-aqueous solutions are aspects where research is needed. Kölbl outlined the successes and failures of several biotechnological conversions.

Heinz Kölbl: "Myself being a Bavarian from Munich, it is a comfort, that beer and wine are still by far ahead!" — referring to a table which showed the world output of biotechnological products in tons per year including beer (54 000 000 tons); wine (28 500 000 tons); antibiotics (25 000 tons); and vitamin B_{12} (3 tons).

Microbial pharmaceuticals

Arnold Demain (MIT, USA) gave a lecture on "Contribution of genetics to the production and discovery of microbial pharmaceuticals". He said that recombinant DNA technology, hybridoma technology, enzyme engineering and protein engineering are all parts of the new biotechnology which is having a major effect on research in health care, diagnostics, agriculture and promises to make inroads in the practices of other industries such as petroleum, mining, foods and chemicals.

Genetics has had a long history of contributions to the production of microbial pharmaceuticals, especially antibiotics. The tremendous increases in antibiotic productivity and the resulting decreases in costs have come about mainly by mutation and screening for higher producing microbial strains. Although mutation was used for 40 years to improve antibiotic production, genetic recombination had been virtually ignored. Recently, a type of genetic engineering called "protoplast fusion" changed the situation markedly.

"Of greatest excitement is the application of recombinant DNA technology to the production of antibiotics and entire antibiotic pathways have already been cloned."

Of greatest excitement is the application of recombinant DNA technology to the production of antibiotics and entire antibiotic pathways have already been cloned. The development of recombinant DNA technology is having its major impact on the production of rare polypeptides which are enzymes, hormones, antibodies or other regulatory agents. As a result, mammalian polypeptides can now be classified as "microbial pharmaceuticals".

In addition to natural polypeptides, analogues can be produced by recombinant DNA technology and this has added an extra dimension of excitement to the field. The future is thus ensured for the expanded use of microorganisms in the pharmaceutical world and the continued improvement in microbial processes to reduce the cost of such drugs.

Biotechnology in the energy and environment sectors

The final lecture, on "Potential applications of biotechnology in the energy and environment sectors" was presented by Ananda Chakrabarty (University of Illinois, USA) — who is Vice-Chairman of the Commission on Biotechnology.

Chakrabarty considered biotechnological approaches to solving some of the problems of environmental pollutions or developing better or alternative sources of energy to be realistic and technically feasible within the near future.

He described some of the potential applications of biotechnology of interest to chemists in the energy and the environment sectors. For example, microbial surfactants appear to be useful in the energy sector not only in enhancing oil recovery but may also be highly useful in controlling environmental pollution from spilled oil or in the clean up of oil-containing drums, barrels and tanks.

Ananda Chakrabarty: "Considerable efforts have been directed towards developing microbial strains either by genetic selection or by gene cloning that allows degradation of a number of highly chlorinated compounds."

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Nomenclature for cyclic organic compounds with contiguous formal double bonds (the δ-convention) (Recommendations 1988)

Substitutive (organic) nomenclature requires that the number of hydrogen atoms, if any, on each skeletal atom of a parent be known unambiguously. Trivial or semisystematic names are used to denote many rings and ring systems containing the maximum number of non-cumulative double bonds. In order to use substitutive nomenclature and the same skeletal names when formal cumulative double bonds, actual or theoretical, are present in these rings and ring systems, a method for indicating the location of a cumulative double bond system is required. Techniques used up to now are either cumbersome or tend to use established techniques in ways other than for which they were designed. The λ-convention for specifying non-standard valency states of skeletal atoms, although useful, is not by itself sufficient for this purpose.

These rules provide a method for unambiguously denoting the presence of cumulative double bonds at a skeletal atom in a ring system that otherwise has the maximum number of non-cumulative double bonds. When combined with the λ-convention, where necessary, the number of hydrogen atoms available for substitution on such skeletal atom is unambiguously known. The basic principles of this method were introduced briefly in Section D of the IUPAC Organic Rules as revised for publication in the 1979 edition.

The δ-convention is fully consistent with the fundamental principles of substitutive nomenclature, which are based on formalized bonding in structural diagrams, and are applicable to organic derivatives of inorganic rings and ring systems. It consists of a symbol, δ^c, where c is an arabic number representing the number of double bonds attached to the skeletal atom indicated by the preceding locant. A non-standard valence state of the skeletal atom is given by the λ-convention, where necessary.

This report was prepared for publication by W. H. Powell, Commission on Nomenclature of Organic Chemistry, (III.1), Organic Chemistry Division and published in PAC, *Vol. 60, No. 9, pp. 1395–1401, 1988.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 8, No. 5, p. 31, 1986. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of May 1987 were taken into consideration when preparing the final report.*

Names of hydrogen atoms, ions, and groups, and for reactions involving them (Recommendations 1988)

These names comprise *general* names, to be used without regard to the nuclear mass of the hydrogen entity, either for hydrogen in its natural abundance or where it is not desired to distinguish between the isotopes, and *specific* names pertaining to specific isotopes.

This report was prepared for publication by J. F. Bunnett and R. A. Y. Jones, Commission on Physical Organic Chemistry (III.2), Organic Chemistry Division and published in PAC, *Vol. 60, No. 7, pp. 1115–1116, 1988.*

A synposis of this report was published as Provisional Recommendations in CI, *Vol. 8, No. 4, p. 21, 1986. These Provisional Recommendations*

	General	^{1}H	^{2}H	^{3}H
The atom (H)	hydrogen	protium	deuterium	tritium
The cation (H^+)	hydron	proton	deuteron	triton
The anion (H^-)	hydride	protide	deuteride	tritide
The group ($^-$H)	hydro	protio	deuterio	tritio
Transfer of the cation to a substrate	hydronation	protonation	deuteronation	tritonation
Replacement of hydrogen by a specific isotope		protiation	deuteriation	tritiation

were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before 31 March 1987 were taken into consideration when preparing the final recommendations.

Glossary of terms used in photochemistry (Recommendations 1988)

The glossary provides definitions of terms and symbols used in photochemistry in order to achieve consensus on adoption of some definitions and on abandonment of inadequate terms.

Photochemistry being interdisciplinary involves also such different areas as laser technology, spectroscopy, polymer science, solid state physics, biology, medicine, etc. It has therefore been necessary to reach compromises and, in some cases, to include alternative definitions used in different areas. It is to be emphasized that the purpose of this compilation is not to impose terms or rules which would hinder the freedom of choice in the use of terminology.

The general criteria adopted for the inclusion of a term have been: (i) its wide use in the present or past literature, and (ii) ambiguity or uncertainty in its usage. With very few exceptions concerning widely accepted terms, name reactions have been omitted. The arrangement of entries is alphabetical and, in general, the criteria adopted previously have been followed (cf. 'Glossary of Terms Used in Physical Organic Chemistry', *PAC*, Vol. 55, No. 8, pp. 1281–1371, 1983).

This glossary was prepared for publication by S. E. Braslavsky and K. N. Houk, Commission on Photochemistry (III.3), Organic Chemistry Division and published in PAC, *Vol. 60, No. 7, pp. 1055–1106, 1988.*

A synopsis of the glossary was published as Provisional Recommendations in CI, *Vol. 8, No. 2, p. 18, 1986. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of December 1986 were taken into consideration when preparing the final glossary.*

Reference materials for fluorescence measurement

Measurement of the fluorescence properties of a molecule (fluorescence spectrum, excitation spectrum, quantum yield and fluorescence lifetime) is critical to the development of an understanding of the photo-physics and photochemistry of the singlet excited state(s) of the species. Reliable and standard methodology is required if published data are to be of use to the photochemical community at large. The purpose of this document is to recommend standard practices and materials for these measurements and to discuss the avoidance of experimental inadequacies attendant on their application in practical use. This is not a comprehensive review of the many techniques advocated as solutions to each aspect of fluorescence measurement but rather it recommends appropriate methods which strike a balance between ease of application, generality of use, and reliability.

This report was prepared for publication by David F. Eaton, Commission on Photochemistry (III.3), Organic Chemistry Division and published in PAC, *Vol. 60, No. 7, pp. 1107–1114, 1988.*

Presentation of molecular parameter values for infrared and Raman intensity measurements (Recommendations 1988)

The field of basic and applied studies of infrared and Raman intensities is growing and more experimental data as well as theoretical works are appearing in the scientific literature. The aim of the document is to point out where lack of common definitions and common use of dynamical and spectroscopic quantities may give rise to confusion among various authors.

Dipole moment changes in infrared (or polarizability changes in the Raman) as determined from experimental spectra suffer from an experimental ambiguity of the choice of the sign. Calculations are employed to analyse the experimental data. Recommendations ask for a correct description of the sign of the various vibrational coordinates used and of the eigenvectors derived from the dynamical matrix. Moreover, when quantum mechanical calculations on infrared or Raman intensities are carried out, there is only one way the vibrational displacement can be forced. Recommendations clarify how and why one can use the correct way.

This report was prepared for publication by M. Gussoni, G. Zerbi and W. Person, Commission on Molecular Structure and Spectroscopy (I.5), Physical Chemistry Division and published in PAC, *Vol. 60, No. 9, pp. 1385–1388, 1988.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 8, No. 2, p. 18, 1986. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of December 1986 were taken into consideration when preparing the final report.*

Nomenclature of glycoproteins, glycopeptides and peptidoglycans (Recommendations 1985)

This document provides a nomenclature for carbohydrates covalently linked to proteins or peptides. Together with the glycolipids and lipopolysaccharides they compose the more general class of compounds known as glycoconjugates. Terms are defined both for the conjugates themselves and for their carbohydrate components, and the nature of the linkage between carbohydrate and protein or peptide is discussed. The peptidoglycans, a group of glycoconjugates found only in bacterial cell walls, are included in the recommendations. A new 'short form' is proposed for representing the structures of complex carbohydrates as compactly as possible. As no recommendations on glycoproteins, glycopeptides and peptidoglycans have been published previously by IUPAC or IUB the new recommendations do not replace any existing document, but they follow established rules of biochemical nomenclature.

This report was prepared for publication by N. Sharon, IUPAC and IUB (International Union of Biochemistry) Joint Commission on Biochemical Nomenclature and published in PAC, *Vol. 60, No. 9, pp. 1389–1394, 1988.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 8, No. 2, p. 19, 1986. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of December 1986 were taken into consideration when preparing the final report.*

Long and short chain branching frequency in low density polyethylene (LDPE)

Five different laboratories have collaborated in a research programme on determination of the branching frequency in a LDPE sample.

Size exclusion chromatography (SEC), SEC-on-line viscosity (OLV) measurements, DSC-, NMR-, viscosity measurements, as well as SEC-on-line low angle laser light scattering (LALLS) measurements and off-line LALLS measurements, were performed on both the whole sample and on fractions. The fractions were obtained by temperature rising elution fractionation (TREF) and by liquid–liquid phase separation (L–L), respectively.

Different long chain branching (LCB)-parameters can be derived. Their differences were explained and some of them were used in this investigation. Also, different B-values in the expression $g' = g^B$ were used and discussed. A B-value of 0.9 was obtained for the global sample.

The conclusion of the fractionation work on the LDPE was that TREF fractionates according to short chain branching (SCB) and that L–L fractionates according to LCB.

This report was prepared for publication by L. I. Kulin, N. L. Meijerink and P. Starck, Working Party on Molecular Characterization of Commercial Polymers, Commission on Polymer Characterization (IV.2), Macromolecular Division and published in PAC, *Vol. 60, No. 9, pp. 1403–1415, 1988.*

Separation and preconcentration of trace substances — V: Microscale preconcentration techniques for trace analysis

The determination of elemental traces in microsamples, that is, micro-trace analysis can be successfully carried out by combining preconcentration steps with modern instrumental determination methods. In this paper, the problems and their solutions for each analytical stage of micro-trace analysis are presented and briefly discussed. Some typical examples of micro-trace analysis are also reviewed.

This report was prepared for publication by G. Tölg, A. Mizuike, Yu. A. Zolotov, M. Hiraide and N. M. Kuz'min, Commission on Microchemical Techniques and Trace Analysis (V.2), Analytical Chemistry Division and published in PAC, *Vol. 60, No. 9, pp. 1417–1424, 1988.*

Nomenclature, symbols, units and their usage in spectrochemical analysis — X: Preparation of materials for analytical atomic spectroscopy and other related techniques (Recommendations 1988)

The preparation of materials prior to spectrochemical analysis is an important and specialized step in the determination of elements, especially where these are at trace levels. This document details the recommended terminology for describing the sampling and preparation of materials for such analyses. Explanatory diagrams of the sampling stages and illustrative examples of the routes from initial sample to the final spectrochemical analysis are also presented.

This report was prepared for publication by A. M. Ure, L. R. P. Butler, R. O. Scott and R. Jenkins, Commission on Spectrochemical and Other Optical Procedures for Analysis (V.4), Analytical Chemistry Division and published in PAC, *Vol. 60, No. 9, pp. 1461–1472, 1988.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 8, No. 4, p. 20, 1986. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of February 1987 were taken into consideration when preparing the final report.*

Nomenclature, symbols, units and their usage in spectrochemical analysis — VII: Molecular absorption spectroscopy, ultraviolet and visible (UV/VIS) (Recommendations 1988)

This report is 7th in the series on Spectrochemical Methods of Analysis issued by IUPAC Commission V.4. It is concerned only with absorption spectra obtained by measuring the transmittance of light through a sample as a function of wavelength. Other techniques such as photoacoustic methods or reflectance measurements will be considered in later reports. The present report has four main sections: (a) terms relating to absorption processes, (b) instrumental factors, (c) measuring techniques, and (d) factors influencing precision and accuracy.

Although absorption spectroscopy has been used for chemical analysis for well over 100 years, there are still many inconsistencies in terminology in the published literature. The American Chemical Society (ACS) has, in its journal *Analytical Chemistry*, suggested nomenclature for absorption spectroscopy for papers published by ACS. It should be noted that some IUPAC recommendations differ from these and furthermore include terms such as double-wavelength, difference and derivative spectroscopies which are not considered in the ACS report.

This report was prepared for publication by K. Laqua, W. H. Melhuish and M. Zander, Commission on Spectrochemical and Other Optical Procedures for Analysis (V.4), Analytical Chemistry Division and published in PAC, *Vol. 60, No. 9, pp. 1449–1460, 1988.*

The synopsis of the report was published as Provisional Recommendations in CI, *Vol. 8, No. 4, p. 21, 1986. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of January 1987 were taken into consideration when preparing the final report.*

IUPAC 1987

Dr M. Williams

Each year the Executive Secretary of IUPAC, prepares a report on IUPAC activities for the International Council of Scientific Unions (ICSU). The following is the 1987 report Dr M. Williams presented to the 22nd ICSU General Assembly held in Beijing, China, 11–16 September 1988.

Boston General Assembly

The main event for IUPAC in 1987 was its 34th General Assembly, which was held in Boston, USA at the end of August. Delegates from 32 of the 42 national adhering organizations were in attendance. The participation of three less developed countries was made possible through a grant from ICSU. An account of the deliberations is given in *IUPAC Handbook 1987–1989* and *Chemistry International* (Nos. 1, 2, and 3, 1988).

IUPAC officers for the period 1987–1989 are:

President — Prof. V. A. Koptyug (USSR)
Vice-President — Prof. Y. P. Jeannin (France)
Secretary General — Prof. T. S. West (UK)
Treasurer — Prof. A. Björkman (Denmark)

Syria ceased to be a member of the union because of arrears in its annual subscription. Applications for membership were accepted from Chile and Saudi Arabia, while Brazil was readmitted subject to formation of a broadly based National Committee for Chemistry. The International Conferences on Solution Chemistry were admitted to Associated Organization status, and the Scientific Research Council of Jamaica was accepted as the fourteenth Observer Country.

Prof. Yves Jeannin, Vice-President, elected at the Boston General Assembly.

Think tanks

A background paper on overall structure and functioning of IUPAC commissions and committees was prepared by a small *ad hoc* committee. The paper and comments thereon were considered at a special 'brainstorming' session of the Bureau in Boston, at which a wide diversity of points and suggestions were made, without any clear consensus being reached. Subsequently, the officers issued a memorandum for division presidents to form forward activity planning groups (think tanks). These groups were to suggest new areas of activity that IUPAC might undertake (future directions for each division and various interdisciplinary matters). In addition, the groups were to consider which multi-year commissions could be dissolved in order to allow such new activities to be undertaken by short-term working groups.

In its second year of operation, the affiliate membership scheme numbers increased by 40% to 7856, with membership from almost 90 countries. Affiliates from the third world rose to just over 700 from 52 countries, with many sponsored by means of grants from UNESCO and ICSU. The scheme undoubtedly provided a much wider mechanism than existed previously for publicizing the activities of the union. Creation of a Committee on Affiliate Membership, to improve the representation of affiliate interests within IUPAC, was proposed.

Progress towards an imaginative programme for an IUPAC–UNESCO initiative in Latin America, involving UNDP, was slow. The IUPAC Seminars/Visiting Professorships project financed an expert from Australia to involve in a workshop on chemical education organized by the Chemical Society of the South Pacific at Suva, Fiji. If an application is successful for financial support from the UNESCO Participation Fund, this project could be expanded considerably.

Sofia Congress

The 31st International Congress of Pure and Applied Chemistry (July, Sofia) attracted some 1700 participants. A rich and varied scientific programme was provided of daily plenary lectures, followed by nine parallel sections and poster sessions.

CHEMRAWN VI (May, Tokyo) was a highly successful and trendsetting conference, dealing with an area of utmost importance to the world today: advanced materials for innovations in energy, transportation and communications. The twice postponed CHEMRAWN IV was finally held in October at Keystone/Colorado, and took the form of a workshop of five panels on modern chemistry and

Prof. C. N. R. "Ram" Rao, IUPAC President, 1985–87 (right) talks to Dr Michel Belombé, Cameroon National Affiliate Membership Secretary (left) at the highly successful and trendsetting CHEMRAWN VI conference held in Tokyo, Japan, May 1987. With them, in the centre, is IUPAC Treasurer, Prof. Anders Björkman. For a report on CHEMRAWN VI see the November 1987 issue of *CI*, pages 216–224. Belombé's account of "Chemistry in Cameroon" and a feature article on CHEMRAWN appeared in the September 1988 issue of *CI*.

chemical technology applied to the ocean and its resources.

Attention was turned to possible future CHEMRAWN topics, such as chemistry and the atmosphere, water as a resource, CHEMRAWN II follow-up on food self-sufficiency, chemical waste as a raw material. Following joint discussions between the CHEMRAWN Committee and the Committee on Chemistry and Industry, the latter assumed responsibility for organizing an IUPAC World Conference on Chemistry and Safety in Production. It will concentrate on scientific and technological issues, and probably be located in Switzerland in 1989–1990, with specialists invited from third world countries.

The Commission on Medicinal Chemistry of the Organic Chemistry Division, which had been under review since 1981, was finally dissolved. In its place a small Section on Medicinal Chemistry was established and attached directly to the Bureau. The initial activity was restricted, in order to permit the section to demonstrate that it could quickly and successfully complete IUPAC-type project work.

The Commission on Teaching in Clinical Chemistry was allowed to continue in existence to the end of 1988, in order to complete current projects before dissolution. A study group was appointed to look into IUPAC's future role in the area of biological chemistry, and to report back to the Bureau in 1988.

Changes in name for two commissions were approved: "Analytical Reactions and Reagents" to "Analytical Reactions, Reagents, and Separations", "Pesticide Chemistry" to "Agrochemicals". Following finalization of protocols for validation of analytical methods, the harmonization of collaborative studies will be continued with ISO and AOAC through an interdivisional working party for harmonization of quality assurance schemes for analytical laboratories.

Recommendations and reports

A considerable range of recommendations and reports was published during the year by IUPAC bodies (see Appendix). The extended trial of the new mechanism for comment and approval of IUPAC (particularly provisional) recommendations on nomenclature and symbols was judged to have been successful, and it was made permanent.

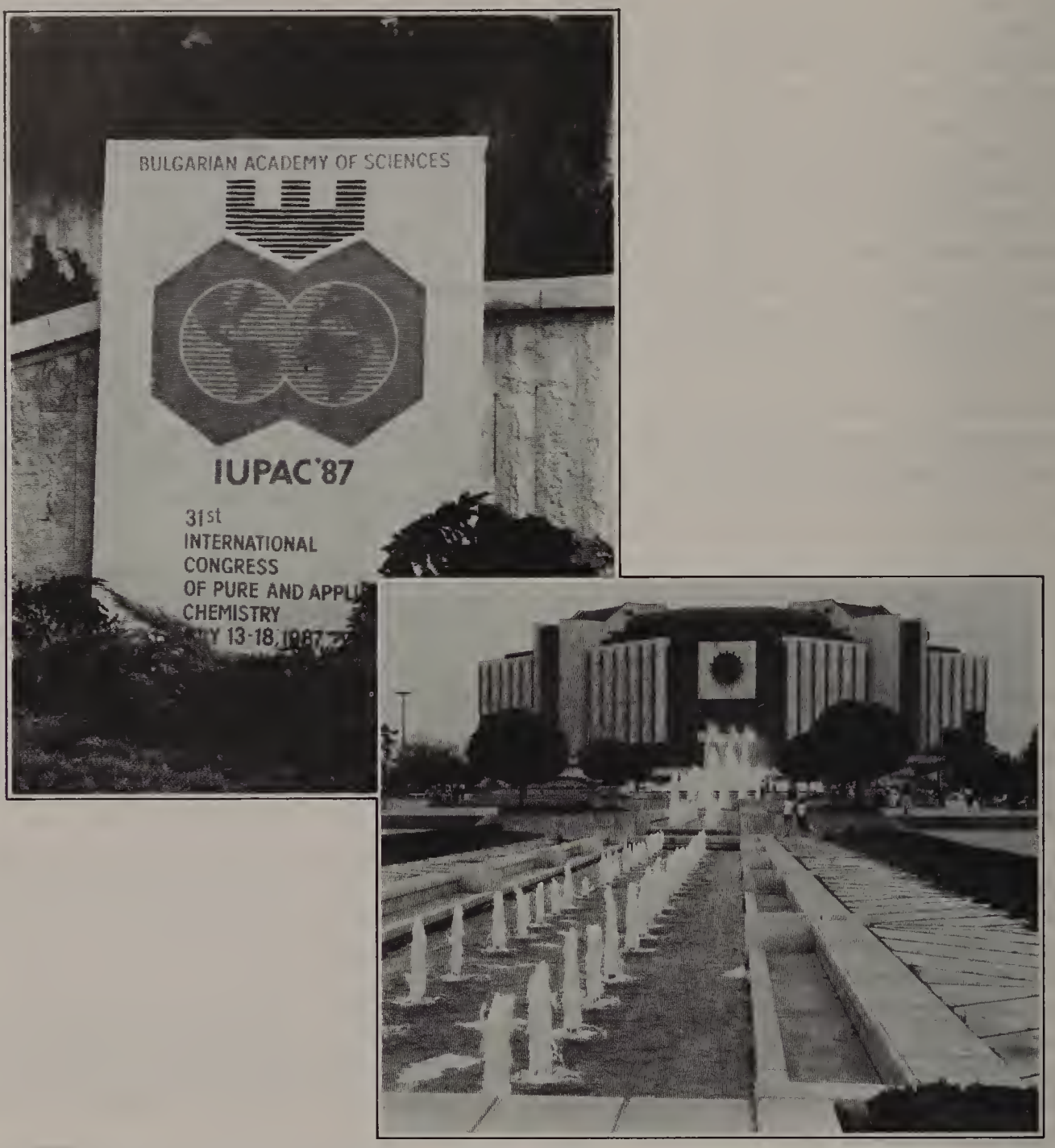
Several major compendia were issued: *Chemical Terminology*; *Analytical Nomenclature* (2nd edition); *Standard Methods for Analysis of Oils, Fats, and Derivatives* (7th edition); *Recommended Reference Materials for Realization of Physicochemical Properties*. Four more volumes appeared in the *Solubility Data Series*, bringing the total to date to 30.

President Rao stressed the need for IUPAC to become more involved in the activities of ICSU, particularly its global programmes. Concern was expressed in the Bureau that chemistry was not being included, as much as was warranted, in the proposed ICSU International Geosphere–Biosphere Programme. A positive contribution seemed possible from IUPAC's Commission on Atmospheric Chemistry.

Appendix

The following recommendations on nomenclature and symbols were published in 1987:

1. Specifications for Infrared Reference Spectra of Molecules in the Vapor Phase (Recommendations 1987), *PAC,* **59**, 673–681 (1987) — Commission on Molecular Structure and Spectroscopy.
2. Nomenclature of Prenols (Recommendations 1986), *PAC*, **59**, 683–689 (1987) — IUB–IUPAC Joint Commission on Biochemical Nomenclature.
3. Use of Abbreviations for Names of Polymeric Substances (Recommendations 1986), *PAC*, **59**, 691–693 (1987) — Commission on Macromolecular Nomenclature.
4. Nomenclature of Tetrapyrroles (Recommendations 1986), *PAC*, **59**, 779–832 (1987) — IUB–IUPAC Joint Commission on Biochemical Nomenclature.
5. Nomenclature and Symbols for Folic Acid and Related Compounds (Recommendations 1986), *PAC*, **59**, 833–836 (1987) — IUB–IUPAC Joint Commission on Biochemical Nomenclature.
6. A Descriptive Classification of the Electron Spectroscopies (Recommendations 1987), *PAC*, **59**, 1343–1406 (1987) — Commission on Molecular Structure and Spectroscopy.
7. Nomenclature of Polyanions (Recommendations 1987), *PAC*, **59**, 1529–1548 (1987) — Commission on Nomenclature of Inorganic Chemistry.
8. Abbreviated List of Quantities in Physical Chemistry (published as a laminated card by Blackwell Scientific Publications, Oxford, 1987) — Commission on Physicochemical Symbols, Terminology, and Units.
9. Compendium of Chemical Terminology — IUPAC Recommendations (published in book form by Blackwell Scientific Publications, Oxford, 1987) — Interdivisional Committee on Nomenclature and Symbols.



The 31st International Congress of Pure and Applied Chemistry was held at the National Palace of Culture (right) in Sofia, Bulgaria, in May 1987. A report on the congress appeared in the January 1988 issue of *CI*, pages 10–22.

10. Compendium of Analytical Nomenclature — 2nd edn (published in book form by Blackwell Scientific Publications, Oxford, 1987) — Commission on Analytical Nomenclature.

The availability of the following provisional recommendations on nomenclature and symbols was announced in 1987:

1. System for Symbolization of Reaction Mechanisms, *CI*, No. 1, 26 (1987) — Commission on Physical Organic Chemistry.

2. Detailed Linear Representation of Reaction Mechanisms, *CI*, No. 1, 26 (1987) — Commission on Physical Organic Chemistry.

3. Recommendations for EPR/ESR Nomenclature and Conventions for Presenting Experimental Data in Publications, *CI*, No. 2, 71 (1987) — Commission on Molecular Structure and Spectroscopy.

4. Nomenclature for Organic Chemical Transfor-

mations, *CI*, No. 4, 150 (1987) — Commission on Physical Organic Chemistry.

5. Neutral Molecular Compounds (Revision of *Nomenclature of Inorganic Chemistry*/The Red Book; Chapter I-7), *CI*, No. 4, 150–151 (1987) — Commission on Nomenclature of Inorganic Chemistry.

6. Coordination Compounds (Revision of *Nomenclature of Inorganic Chemistry*/The Red Book; Chapter I-10), *CI*, No. 4, 151 (1987) — Commission on Nomenclature of Inorganic Chemistry.

7. Nomenclature of Steroids (Recommendations 1986), *CI*, No. 5, 180 (1987) — IUB–IUPAC Joint Commission on Biochemical Nomenclature.

8. Nomenclature of Thermal Analysis: Part V — Symbols, *CI*, No. 5, 181 (1987) — Commission on Analytical Nomenclature.

9. Nomenclature and Symbolism for Mass Spectroscopy, *CI*, No. 5, 181 (1987) — Commission on Molecular Structure and Spectroscopy.

10. Quantities and Units for Metabolic Processes as a Function of Time, *CI*, No. 5, 181 (1987) — Commission on Quantities and Units in Clinical Chemistry.

11. Oxoacids (Revision of *Nomenclature of Inorganic Chemistry*/The Red Book; Chapter I-9), *CI*, No. 5, 181 (1987) — Commission on Nomenclature of Inorganic Chemistry.

12. Boron Hydrides and Related Compounds (Revision of *Nomenclature of Inorganic Chemistry*/The Red Book; Chapter I-11), *CI*, No. 5, 182 (1987) — Commission on Nomenclature of Inorganic Chemistry.

13. Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis: Part VIII — Nomenclature System for X-Ray Spectroscopy, *CI*, No. 60, 233 (1987) — Commission on Spectrochemical and Other Optical Procedures for Analysis.

The following technical reports by IUPAC bodies were published during the year:

1. A Collaborative Study of the Stability of Extrusion, Melt Spinning and Tubular Film Extrusion of Some High-, Low- and Linear-low Density Polyethylene Samples, *PAC*, **59**, 193–216 (1987) — Commission on Polymer Characterization and Properties.

2. The Onset of Runaway Creep in HIPS (High Impact Polystyrene): A study in Variability, *PAC*, **59**, 217–220 (1987) — Commission on Polymer Characterization and Properties.

3. Determination of Aluminium in Biological Materials by Graphite Furnace Atomic Absorption Spectrometry (GFAAS), *PAC*, **59**, 221–228 (1987) — Commission on Microchemical Techniques and Trace Analysis.

4. Distribution Analysis of Major and Trace Elements through Semiconductor Layers of Changing Matrix using Secondary Ion Mass Spectrometry (SIMS), *PAC*, **59**, 229–244 (1987) — Commission on Microchemical Techniques and Trace Analysis.

5. Electrochemical Analysis of Organic Pollutants, *PAC*, **59**, 245–256 (1987) — Commission on Electroanalytical Chemistry.

6. Measurement of Cellulase Activities, *PAC*, **59**, 257–268 (1987) — Commission on Biotechnology.

7. Recommended Approach to the Appraisal of Risks to Consumers from Pesticide Residues in Crops and Food Commodities, *PAC*, **59**, 611–624 (1987) — Commission on Pesticide Chemistry.

8. Determination of Fluoride in Various Matrices, *PAC*, **59**, 695–702 (1987) — Commission on Microchemical Techniques and Trace Analysis.

9. Purification of Solvents for Electroanalysis: Benzonitrile; Dichloromethane; 1,1-Dichloroethane and 1,2-Dichloroethane, *PAC*, **59**, 703–714 (1987) — Commission on Electroanalytical Chemistry.

10. Polarographic Determination of Adsorbable Molecules, *PAC*, **59**, 715–722 (1987) — Commission on Electroanalytical Chemistry.

11. Recommended Methods for Characterization of Agricultural Residues and Feed Products Derived Through Bioconversion, *PAC*, **59**, 723–730 (1987) — Commission on Biotechnology.

12. Organic Analytical Reagents in Nuclear Magnetic Resonance Spectroscopy, *PAC*, **59**, 915–926 (1987) — Commission on Analytical Reactions and Reagents.

13. Interlaboratory Trial on the Determination of Selenium in Lyophilized Human Serum, Blood and Urine using Hydride Generation Atomic Absorption Spectrometry, *PAC*, **59**, 927–936 (1987) — Commission on Toxicology.

14. Determination of Total and 'Free' Hexane content in Extraction Meals: Results of a Collaborative Study and the Standardised Method, *PAC*, **59**, 1407–1418 (1987) — Commission on Oils, Fats, and Derivatives.

15. Potential Contamination of Ground Water by

Pesticides, *PAC*, **59**, 1419–1446 (1987) — Commission on Pesticide Chemistry.

16. Reference Value Standards and Primary Standards for pH Measurements in Organic Solvents and Water + Organic Solvent Mixtures of Moderate to High Permittivities, *PAC*, **59**, 1549–1560 (1987) — Commission on Electroanalytical Chemistry.

17. Determination of 'Hexane' Residues in Oils: Results of a Collaborative Study and the Standardised Method, *PAC*, **59**, 1561–1570 (1987) — Commission on Oils, Fats, and Derivatives.

18. Characterization of Si_3N_4 Powders, *PAC*, **59**, 1673–1680 (1987) — Commission on High Temperature and Solid State Chemistry.

19. Metal Buffers in Chemical Analysis: Part I — Theoretical Considerations, *PAC*, **59**, 1681–1692 (1987) — Commission of Analytical Reactions and Reagents.

20. Autoprotolysis Constants in Nonaqueous Solvents and Aqueous Organic Solvent Mixtures, *PAC*, **59**, 1693–1702 (1987) — Commission on Electroanalytical Chemistry.

21. A Critical Survey of Stability Constants of Cyano Complexes, *PAC*, **59**, 1703–1720 (1987) — Commission on Equilibrium Data.

22. Recommended Procedure for Testing the Potentiometric Apparatus and Technique for the pH-metric Measurement of Metal-Complex Equilibrium Constants, *PAC*, **59**, 1721–1728 (1987) — Commission on Equilibrium Data.

23. Recommended Method for the Gas Chromatographic Profile Analysis of Polycyclic Aromatic Hydrocarbons in Smoked Food, *PAC*, **59**, 1729–1734 (1987) — Commission on Food Chemistry.

24. Recommended Method for a Thin-Layer-Chromatographic Screening Method for the Determination of Benzo(a)pyrene in Smoked Food, *PAC*, **59**, 1735–1738 (1987) — Commission on Food Chemistry.

25. Measurement of Hemicellulase Activities: Part I — Xylanases, *PAC*, **59**, 1739–1752 (1987) — Commission on Biotechnology.

26. Standard Methods for the Analysis of Oils, Fats, and Derivatives — 7th revised and enlarged edn (published as a loose-leaf binder by Blackwell Scientific Publications, Oxford, 1987) — Commission on Oils, Fats, and Derivatives.

27. Recommended Reference Materials for the Realization of Physicochemical Properties (published in book form by Blackwell Scientific Publications, Oxford, 1987) — Subcommittee on Physicochemical Measurements and Standards.

28. International Thermodynamic Tables of the Fluid State: Volume 9 — Oxygen (published in book form by Blackwell Scientific Publications, Oxford, 1987) — Commission on Thermodynamics.

29. Solubility Data Series: Volume 27/28 — Methane (published in book form by Pergamon Press, Oxford, 1987) — Commission on Solubility Data.

30. Solubility Data Series: Volume 29 — Mercury in Liquids, Compressed Gases, Molten Salts, and Other Elements (published in book form by Pergamon Press, Oxford, 1987) — Commission on Solubility Data.

31. Solubility Data Series: Volume 30 — Alkali Metal Halates, Ammonium Iodate and Iodic Acid (published in book form by Pergamon Press, Oxford, 1987) — Commission on Solubility Data.

Thirty symposia were sponsored by IUPAC in 1987, namely:

1. International Symposium on Characterization of Porous Solids, Bad Soden/FRG, April (Proceedings to be published by Elsevier, Amsterdam, 1988).

2. 5th International Conference on High Temperature and Energy-related Materials, Rome/Italy, May (*PAC*, **60**, (3), 1988).

3. 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences, Ghent/Belgium, May (*PAC*, **59**, (5), 1987).

4. International Symposium on Free Radical Polymerization: Kinetics and Mechanisms, Santa Margherita Ligure/Italy, May (Proceedings published as Volume 10/11 in the series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1987).

5. CHEMRAWN VI — World Conference on Advanced Materials for Innovations in Energy, Transportation, and Communications, Tokyo/Japan, May (Preprints book and Pespectives & Recommendations volume issued by The Chemical Society of Japan, 1987).

6. IMEBORON VI: 6th International Conference on Boron Chemistry, Bechyne/Czechoslovakia, June (*PAC*, **59**, (7), 1987).

The main event

Boston's Kenmore Square area — close to Boston University, venue of the General Assembly.

Council members congratulate Prof. Jeannin on his election as Vice-President.

Bags of documents at registration await the arrival of General Assembly participants.

The main event for IUPAC in 1987 was its 34th General Assembly, which was held in Boston, USA at the end of August.

7. 8th International Symposium on Organosilicon Chemistry, St Louis, MA/USA, June (Proceedings published as a book by Ellis Horwood Ltd, Chichester, 1988).

8. 2nd International Workshop on Behavior of Pollutants in Porous Media, Bet Dagan/Israel, June (Proceedings not published yet).

9. 31st IUPAC Macromolecular Symposium, Merseburg/GDR, June-July (Proceedings published as Vol. 12 in the series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1987).

10. 3rd International Conference on Bioinorganic Chemistry, Noordwijkerhout/Netherlands, July (PAC, **59**, (6) 1987).

11. 31st IUPAC Congress, Sofia/Bulgaria, July (Proceedings published as 9 booklets by Bulgarian Academy of Sciences, Sofia, 1987).

12. 9th International Conference on Chemical Education: Chemistry for Our New World, Sao Paulo/Brazil, July (Conference report and abridged versions of plenary lectures published in *Intl. Newsletter on Chem. Educ.*, No. 28, December 1987).

13. 1st International Conference on Heteroatom Chemistry, Kobe/Japan, July (*PAC*, **59**, (8), 1987).

14. 4th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis, Vancouver/Canada, July (*PAC*, **60**, (1), 1988).

15. 30th Microsymposium on Macromolecules: Polymer-supported Organic Reagents and Catalysts, Prague/Czechoslovakia, July (*PAC*, **60**, (3), 1988).

16. 10th Discussion Conference on Macromolecules: Small-angle Scattering and Related Methods, Prague/Czechoslovakia, July (Proceedings published as Vol. 15 in the series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1988).

17. 12th International Symposium on Macrocyclic Chemistry, Hiroshima/Japan, July (*PAC*, **60**, (4), 1988).

18. 25th International Conference on Coordination Chemistry, Nanjing/China, July (to be published in *PAC*, 1988).

19. Symposium on Biotechnology in Chemistry, Boston/USA, August (*PAC*, **60**, (6), 1988).

20. 2nd Nordic Symposium on Trace Elements in Human Health and Disease, Odense/Denmark, August (Proceedings not to be published).

21. 4th European Symposium on Thermal Analysis and Calorimetry, Jena/GDR, August (Proceedings to be published in *Journal of Thermal Analysis (JTA)*, 1988).

22. International Conference on the Applications of the Mössbauer Effect, Melbourne/Australia, August (Proceedings to be published as an issue of the journal *Hyperfine Interactions*, 1988).

23. World Congress of Theoretical Organic Chemists, Budapest/Hungary, August (*PAC*, **60**, (2). 1988).

24. 8th International Symposium on Cationic Polymerization and Related Processes, Munich/FRG, August (Proceedings published as Vol. 13/14 in the series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf, Basel, 1988).

25. International Symposium on Polymers for Advanced Technologies, Jerusalem/Israel, August (Proceedings to be published as a volume in the series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf, Basel, 1988).

26. 8th International Symposium on Solute–Solute–Solvent Interactions, Regensburg/FRG, August (*PAC*, **59**, (9), 1987).

27. 6th International Conference on Fourier Transform Spectroscopy Vienna/Austria, August (Proceedings not published yet).

28. 8th International Symposium on Plasma Chemistry, Tokyo/Japan, August–September (*PAC*, **60**, (5), 1988).

29. 3rd International Workshop on Vapor–Liquid Equilibria in l-Alkanol + *n*-Alkane Mixtures, Budapest/Hungary, September (Proceedings not published yet).

30. CHEMRAWN IV — Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources, Colorado/USA, October (*Applied Geochemistry*, **3**, (1), 1988). Perspectives & Recommendations volume to be published in collaboration with American Chemical Society, 1988).

IUPAC Accounts for 1987

The audited IUPAC accounts for 1987 are preceded by the auditors' report and an introduction by IUPAC Treasurer Prof. Anders Björkman.

Introduction

As pointed out previously, the audited statements of accounts are not easy nor fascinating reading. They are rather formal documents, passing the message that the financial management of IUPAC has been duly controlled, and that there is a reasonable level of assets.

On reading, someone may wish to make comments or ask questions, and I would welcome any such query as an indication of interest in IUPAC management or of the need for better information.

The budgets for 1986 and 1987 were made in Lyon 1985 to establish — for approval by the Council — the total amount of national subscriptions required to support a definite level of activities (meetings of IUPAC bodies before and at the general assembly, administration, and so on). The sum of invoiced subscriptions is definitely the budgeted figure, but other items may deviate from the 1987 budget for various reasons.

The responsibility of the Treasurer, with the experienced support of the Secretariat, is to keep the total expenditures within the approved budget unless the Officers/Executive Committee have decided that circumstances call for and allow additional spending.

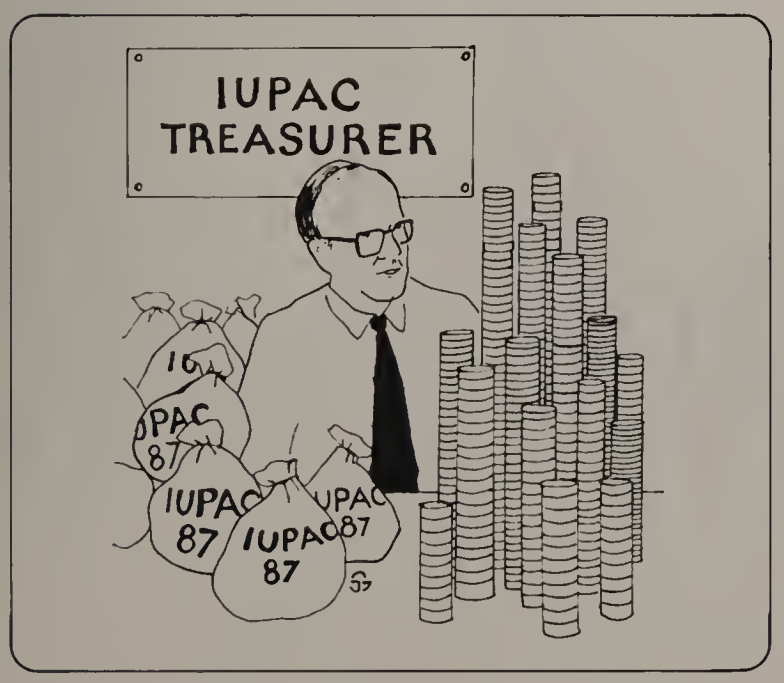
Deviations from the 1987 budget are examined in detail at the end of the year, but it would be senseless to enter into the many details here.

There are, and have always been outstanding subscription payments from IUPAC member countries. I am happy to report that the 1987 figures are lower than previously. Also, the provisions for bad debts are reduced, since the need for them is becoming less.

Another positive observation is the high level of interests and dividends earned, in spite of the drop in the USD exchange rate and the October 1987 stock exchange "crash". It indicates the good advice on investments given by Dr A. Hartmann to the Finance Committee. The income from the IUPAC publisher (Blackwell Scientific Publications) may appear moderate, but considerable additional revenue, derived in 1987, has been paid this year.

The CHEMRAWN and the Affiliate Membership Scheme finances are presented in separate statements and the final overall outcome of the year for the Union appears in the balance sheet (not in the general income and expenditure statement, unless there has been a deficit, counterbalanced from the IUPAC budget). The involvement of the CHEMRAWN rolling fund was moderate in 1987, since the CHEMRAWN IV and IV conferences were brought about with sufficient contributions from non-IUPAC sources.

Anders Björkman
Treasurer



Auditors' Report

As auditors of the International Union of Pure and Applied Chemistry we have examined the accounts for the year ended 31 December, 1987 in accordance with the provisions of Swiss law. Our examination included a review of the accounting records at the Union's Secretariat in Oxford.

We have come to the conclusion that:

- the balance sheet and statements of income and expenses are in agreement with the books,
- the books of account have been properly kept,
- the financial position and the result of operations are presented in accordance with the principles of evaluation prescribed by Swiss law and the requirements of the statutes.

As a result of our examination we recommend that the accounts submitted to you be approved.

NEUTRA TREUHAND AG

Erratum

The "Statement of General Income and Expenditure for Year ended 31 December 1986" (*CI*, Vol. 9, No. 6, p. 242, 1987) contains two errors. The superscript 'b' should not have appeared after 'Bad Debts' under 'Expenditure', nor 'e' after 'Committed Expenditure' under 'Income'.

Balance Sheet for 1987 (expressed in USD)

Assets			**Liabilities**		
Cash in Banks			*Capital Account*		1 864 038.26
USD	31 525.32				
GBP	18 783.00		*Accounts Payable*[d]		10 819.50
CHF	7 326.00				
DEM	6 532.00		*Provisions*		
Money Market Investments	348 740.00		Bad Debts	57 413.50	
Cash in East European Banks[a]	2 272.50	415 178.82	CHEMRAWN Rolling Fund[e]	13 755.56	
			Neutra Examination 1987	4 000.00	
Marketable Securities at Cost		1 706 831.71	Affiliate Activities[f]	13 349.89	
			Solubility Data Series	2 524.68	
Accounts Receivable[b]		3 489.00	Seminars, IVPs[g]	3 567.00	
Sundry Debtor		55 283.00	History of IUPAC[h]	20 000.00	114 610.63
Subscriptions, etc. Outstanding[c]			*Excess of Income over Expenditure*	163 635.49	
National Organizations	61 550.00				
Observer Countries Service Charges	50.00		*Deprec./Profit on Sold Securities*		
Company Assoc. Service Charges	775.00	62 375.00	*and Swap*	90 053.65	253 689.14
		2 243 157.53			2 243 157.53

Notes for 1987 Balance Sheet

(a) *Cash in East European Banks*

Bulgaria	112.50
Czechoslovakia	1 740.00
Hungary	150.00
USSR	270.00
	2 272.50

See Affiliate Membership Scheme Income and Expenditure Statement.

(b) *Accounts Receivable*

Swiss Computation Tax Recoverable		7.00
Affiliate Membership Scheme Payments		
Individual Subscriptions	67.00	
China (Taiwan)	40.00	
Japan	3 060.00	
Kuwait	135.00	
New Zealand	180.00	3 482.00
		3 489.00

(c) *Subscriptions, etc. Outstanding*

National Organizations (1985)		
Belgium	8 500.00	
Poland	7 700.00	16 200.00
National Organizations (1986)		
Iraq	2 500.00	
Peru	650.00	
Romania	8 600.00	
Turkey	1 500.00	13 250.00
National Organizations (1987)		
Argentina	4 700.00	
Austria	950.00	
Greece	1 350.00	
India	10 200.00	
Iraq	2 500.00	
Malaysia	650.00	
Peru	650.00	
Romania	8 600.00	
Turkey	2 500.00	32 100.00
Service Charges Company Assoc. (1986)		
Egypt		50.00
Service Charges Company Assoc. (1987)		
Greece	25.00	
Ireland	50.00	
UK	650.00	725.00
Service Charges Obs. Countries (1987)		
Hong Kong		50.00
		62 375.00

(d) *Accounts Payable*

Advance payments		
Chile	650.00	
Malawi	25.00	
Portugal	400.00	1 075.00
List Secretariat Oxford (Expenses not yet passed through bank account)		3 423.00
List Zürich (Liabilities not paid)		6 321.50
		10 819.50

(e) See CHEMRAWN Income and Expenditure Statement.

(f) See Affiliate Membership Scheme Income and Expenditure Statement.

(g) IUPAC Visiting Professorships.

(h) Subsidy towards publication.

Statement of General Income and Expenditure for Year ended 31 December 1987 (expressed in USD)

Expenditure			Income		
Office Expenses			*National Subscriptions*		
IUPAC Officers	7 933.00		Received	419 647.00	
IUPAC Secretariat (non-publ.)	210 429.00		Outstanding	32 100.00	451 747.00
Audit, Bank Fees, Other Charges	39 376.81	257 738.81			
			Company Associates Service Charges		
Expenses IUPAC Bodies			Received	4 844.00	
Administration Expenses	12 687.11		Outstanding	725.00	5 569.00
Meetings:					
Other than Gen. Assembly	86 663.14		*Observer Countries Service Charges*		
General Assembly	423 090.00	522 440.25	Received	700.00	
			Outstanding	50.00	750.00
Symposia, Seminars, IVPs		933.00			
			Interest and Dividends Earned		203 778.27
Bad Debts Write Off		25 989.50			
			Subvention/Grants from ICSU		24 029.00
Other Expenses					
ICSU Grants	9 050.00		*Transfer from Publications Account*		119 272.89
UNESCO Contracts	1 000.00				
Contributions to ICSU	10 676.08		*Withdrawals from Provisions*		
Reps. other Organizations	3 708.50	24 434.58	Seminars, IVPs	933.00	
			Committed Expenditure[a]	138 000.00	
Excess of Income over Expenditure		163 635.49	Bad Debts	25 989.50	164 922.50
			Foreign Exchange Differences[b]		24 102.97
			Other Income		
			UNESCO Contracts		1 000.00
		995 171.63			995 171.63

Notes for Statement of General Income and Expenditure for Year ended 31 December 1987

(a) Remaining Divisional funds allocated for 1985–6.
(b) Because of currency fluctuations there is a gain (or loss) with GBP, CHF and DEM relative to USD used for accounting.

Statement of Publications Income and Expenditure for Year ended 31 December 1987 (expressed in USD)

Expenditure		
IUPAC Secretariat (publ.)		106 153.00
Sol. Data Ser.		
Expended	1 148.00	
Provision made	2 524.68	3 672.68
Miscellaneous Expenditure		7 264.03
Transfer to General Income and Expenditure Statement		119 272.89
		236 362.60

Income		
Publications		
Blackwell	170 000.00	
Pergamon	22 579.08	
Other Publishers	9 510.84	
Secretariat	175.00	202 264.92
Support of Publication Activities by Blackwell and Pergamon		13 000.00
Special National Contributions		16 425.00
Sol. Data Ser.		
Last Year's Provision	3 672.68	
Income	1 000.00	4 672.68
		236 362.60

Statement of CHEMRAWN Income and Expenditure for Year ended 31 December 1987 (expressed in USD)

Expenditure	
Travel and Other Expenses	6 600.00
Nairobi CHEMRAWN Workshop	25 000.00
	31 600.00

Income	
Pergamon Royalty	181.35
Transfer from Provision for CHEMRAWN Rolling Fund	31 418.65
	31 600.00

Statement of AMS Income and Expenditure for Year ended 31 December 1987 (expressed in USD)

Expenditure	
Salaries	22 261.00
Share Secretariat Cost	9 088.00
Miscellaneous Expenses	15 645.00
Transfer to Provision for Affiliate Activities	13 349.89
	60 343.89

Income	
Subscriptions	
In USD	58 071.39
Cash in East European Banks	2 272.50
	60 343.89

Securities Account Statement as at 31 December 1987

		Approx. Price, %	Approx. Value, USD	Book Value at Cost, USD		Profit/Loss this Year, USD
(a) Bonds						
6.625% Eurofima 1985–14.2.92	JPY 5 000 000	103	42 337.00	28 661.00	+	13 676.00
7.50% Deutschland 20.4.89	DEM 400 000	103.5	263 098.00	153 062.00	+	110 036.00
5.75% Deutschland 1986–20.6.96	DEM 200 000	96.05	122 080.00	108 473.00	+	13 607.00
6% Deutsche Bundespost 1987–1.7.97	DEM 100 000	96	61 008.00	55 063.00	+	5 945.00
3.5% Rhein. Westf. EW 1986–3.4.96	DEM 125 000	80.85	64 225.00	56 348.00	+	7 877.00
6.75% Europ. Investm. Bank 22.8.97	DEM 70 000	102.50	45 597.00	30 937.00	+	14 660.00
11% BASF 1982–1.3.88	USD 100 000	98.60	98 600.00	99 721.39	–	1 121.39
7% B.P. 1985–14.3.92	JPY 5 000 000	107.25	44 084.00	29 468.00	+	14 616.00
11.75% Nat. Westminster 1982–1.11.92	USD 100 000	108.125	108 124.00	99 230.17	+	8 893.83
8.75% Olivetti 1985–15.4.93	ECU 60 000	96.25	75 405.00	51 785.00	+	23 620.00
6% UBS 1985–27.11.92	USD 150 000	88.375	132 562.00	134 352.11	–	1 790.11
9% Philips 1985–30.5.93	ECU 75 000	101	98 908.00	67 495.00	+	31 413.00
7% Schweden 1987–12.2.92	USD 125 000	89.625	112 031.00	119 524.43	–	7 493.43
4.625% Nagasakiya 1987–12.3.92	CHF 100 000	97	76 528.00	66 447.00	+	10 081.00
6.75% Dow Chem. 1985–24.10.95	DEM 100 000	103.95	66 060.00	44 372.00	+	21 688.00
11.25% J. P. Morgan 1985–28.2.92	USD 100 000	104	104 000.00	99 165.70	+	4 834.30
6.50% Philip Morris 1986–14.2.91	JPY 5 000 000	103.875	42 697.00	28 295.00	+	14 402.00
11.375% Connecticut Savings 26.2.90	USD 60 000	104	62 400.00	60 560.17	+	1 839.83
Sub-Total Bonds			1 619 744.00	1 332 959.97	+	286 784.03
(b) Shares						
Shs Fidelity Magellan Fund	7 752	USD 40.10	310 860.00	373 871.74	–	63 011.74
Total			1 930 604	1 706 831.71	+	223 772.29

Conferences

Computer application in the chemical industry

The European Symposium on Computer Application in the Chemical Industry will be held in Erlangen, FRG, 23–26 April 1989.

The main topic will be divided into the following subject groups: Expert systems and data bank management systems; Computer integrated production; Process synthesis and design; New developments in computing.

Further information from: DECHEMA, Attn: Mrs L. Schubel, POB 97 01 46, D-6000 Frankfurt am Main 97, FRG. Tel: +49 (69) 75 64–235/209. Telex 412490 dcha d.

Oils, fats and waxes *Auckland, New Zealand, 12–17 February 1989*

IUPAC SPONSORED

A previous conference held in 1983 stimulated the growing interest in New Zealand in all aspects of animal, fish and vegetable oils, particularly from a point of view of nutrition and health. That conferences, also entitled "Fats for the Future" was held in Auckland under the chairmanship of Stanley G. Brooker. The key to the success of the conference was the relatively small number of delegates (300), the innovative, interesting and well presented papers and the informal nature of the conference sessions and very informal social occasions.

The **Stanley G. Brooker Memorial Prize** will be awarded at the 1989 conference to the author of the most innovative and stimulating paper presented by a young lipid scientist aged 32 or less at 31 December 1988.

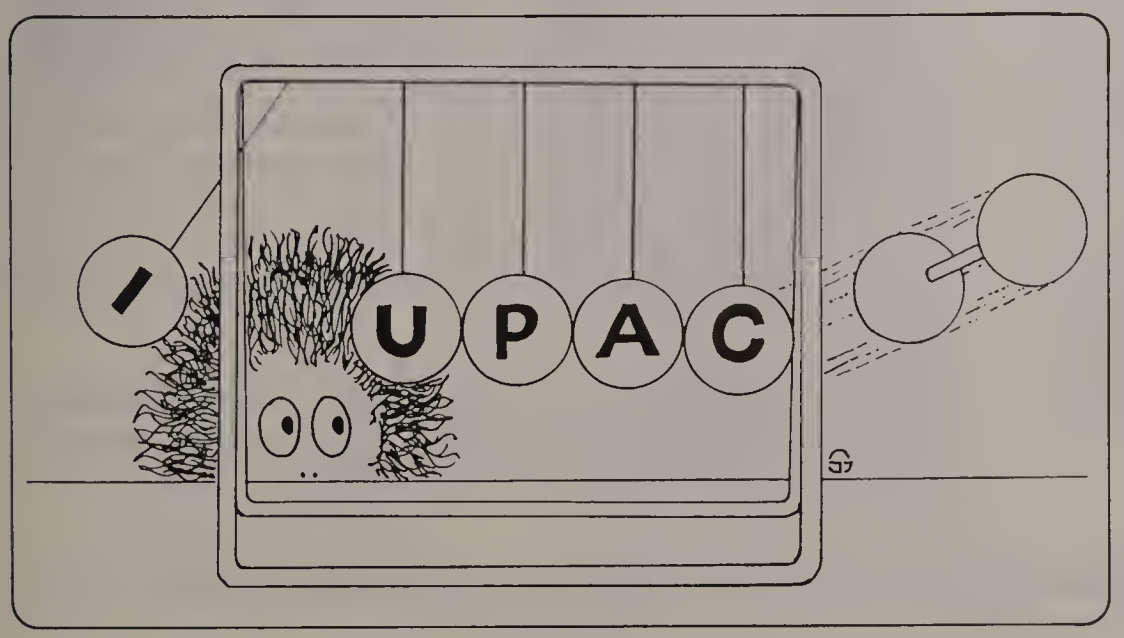
The papers presented at the conference will be grouped into the following sessions:

- The chemistry of lipids
- Industrial processing and technology, commercial developments and new oilseeds
- Medical and nutritional aspects of lipids
- Economic and marketing trends
- Dairy lipids
- Biotechnology
- Chromatography
- Palm oil/palm kernel oil.

Registration fees range from NZD 100 for students to NZD 400 for late registrants. Registered participants are entitled to attend the opening ceremony, all scientific sessions, and all official evening functions. Morning and afternoon teas are included in the fee.

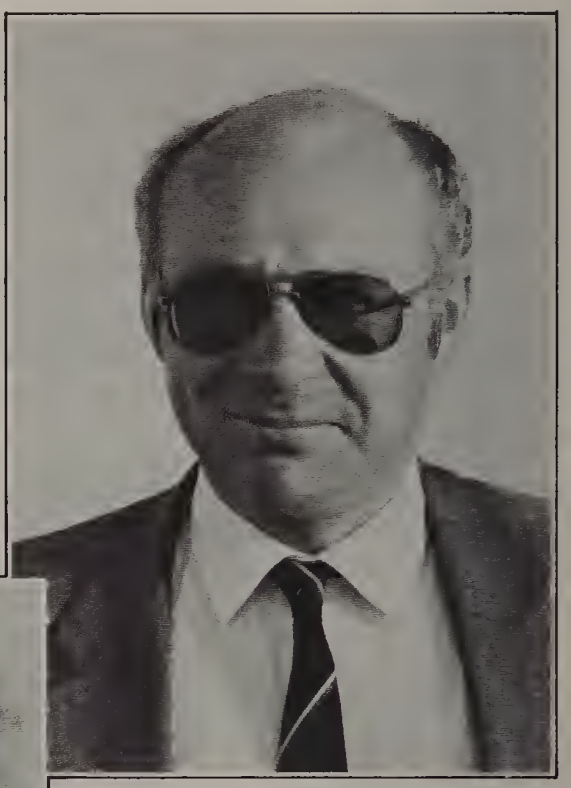
Accommodation will be available on a pre-booking basis ranging from university hostel to top class international hotels at rates ranging from NZD 40.00 to NZD 300 per night.

The conference is being held at one of the warmest times of the year. February is at the end of the New Zealand summer. The mean daily temperature is likely to be 20–22°C, with an overnight minimum of between 16–18°C. Light clothing is recommended with perhaps a light pullover or jacket for the evening. There is a possibility of showers and these may be heavy but of short duration.

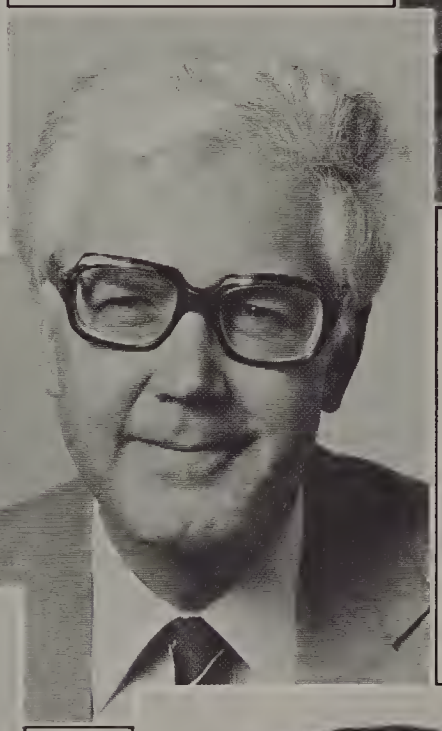


The International Conference on Oils, Fats and Waxes: "Fats for the Future II" will be held at the University of Auckland, Auckland, New Zealand from 12–16 February 1989, with a special session on chromatography held on 17 February 1989. The purpose of the conference is to provide an international forum to promote the exchange of ideas and experiences pertaining to oils, fats, waxes and other lipids.

Dr Laurence Eyres, ▶ Chairman of the Organizing Committee.



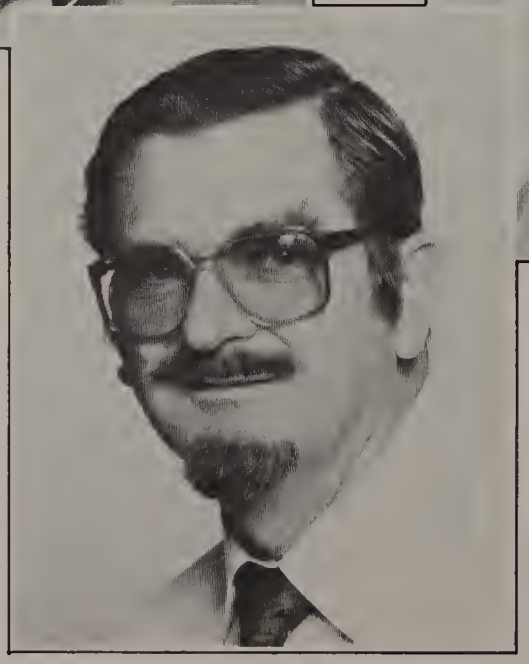
Mr David Illingworth, lecturer on dairy lipids. ▼



Prof. John Birkbeck, Medical ▶ Programme.

Dr Dianne Webster, ▲ Chromatography Session.

Ms Diana Fenton, Technical ▲ Programme.



◀ Prof. R. C. Cambie, Deputy Chairman of the Organizing Committee.

Some of the members of the Organizing Committee of the International Conference on Oils, Fats and Waxes to be held in Auckland, New Zealand, February 1989.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1988

Surface Adsorption & Chromatography

13–17 November. International Symposium on Surface Adsorption & Chromatography (dedicated to the memory of A. V. Kieslev) Moscow, USSR.
(Institute of Physical Chemistry, Academy of Sciences of the USSR, Leninsky prospect, 31, Moscow 117915, USSR.)

1989

Oils, Fats and Waxes

12–17 February. International Conference on Oils, Fats and Waxes. Auckland, New Zealand.
(Mrs. Jennifer Gray, Conference Secretary, Fats for the Future II, c/o Chemistry Department, University of Auckland, New Zealand.)

Inorganic Materials at High Temperatures

3–7 April. Sixth International Conference on High Temperatures: Chemistry of Inorganic Materials at High Temperatures. Gaithersburg, Maryland, USA.
(Dr J. W. Hastie, Group Leader, High Temperature Chemistry, National Bureau of Standards, Gaithersburg, MD 20899, USA.)

Cationic Polymerization

5–9 June. Ninth International Symposium on Cationic Polymerizations and Other Ionic Processes. Strasbourg, France.
(Secretariat of the 9th Symposium on Cationic Polymerizations, Institut Charles Sadron (CRM/EAHP), 6 Rue Boussingault, 67083 Strasbourg Cedex, France.)

Fats

6–9 June. International Congress Chevreul or Study of Fats. Angers, France.
(Chevreul International Congress Angers 1989, Centre de Congrès, 33 boulevard Carnot, 49100 Angers, France.)

Molecular Design of Functional Polymers

26–28 June. International Symposium on Molecular Design of Functional Polymers. Seoul, Korea.
(Secretariat, IUPAC International Symposium, c/o Polymer Society of Korea, Rm. 601, Hyecheon Building, 831 Yeoksam-dong, Kangnam-ku, Seoul 135–792, Korea.)

Coordination Chemistry

2–7 July. 27th International Conference on Coordination Chemistry, Queensland, Australia.
(XXVII ICCC Conference Secretariat, UniQuest Limited, University of Queensland, St Lucia, Queensland 4067, Australia.)

Phosphorus Chemistry

3–8 July. 11th International Conference on Phosphorus Chemistry. Tallinn, USSR.
(Prof. M. Veiderma, Technical University, 5 Ehitajate Road, Tallinn 200108, Estonian SSR, USSR.)

Polymer Blends

17–20 July. 32nd Microsymposium on Macromolecules "Polymer Blends". Prague, Czechoslovakia.
(Dr P. Cefelín, PMM Chairman, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovskeho n. 2, 16206 Prague 6- Petriny, Czechoslovakia.)

Heteroatom Chemistry

17–22 July. Second International Conference on Heteroatom Chemistry (ICHAC-2). Albany, New York, USA.
(Prof. E. Block, Chairman, ICHAC-2, Department of Chemistry, State University of New York at Albany, Albany, NY 12222, USA.)

Bioinorganic Chemistry

24–28 July. Fourth International Conference on Bioinorganic Chemistry. Cambridge, Massachusetts, USA.
(Prof. K. D. Karlin, Chairman, ICBIC-4, Department of Chemistry, SUNY at Albany, Albany, NY 12222, USA.)

Analytical Chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Miss P. E. Hutchinson, Secretary of the Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

IUPAC Congress

2–7 August. 32nd IUPAC Congress. Stockholm, Sweden. (IUPAC, c/o Stockholm Convention Bureau, Box 6911, S-102 39 Stockholm, Sweden.)

Solution Chemistry

6–11 August. 20th International Conference on Solution Chemistry. Jerusalem, Israel. (Secretariat XX ICSC, PO Box 50006, Tel Aviv 61500, Israel.)

IUPAC General Assembly

9–17 August. 35th IUPAC General Assembly. Lund, Sweden. (The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

Heterocyclic Chemistry

13–17 August. 12th International Congress of Heterocyclic Chemistry (ICHC). Jerusalem, Israel. (Prof. A. Hassner, Department of Chemistry, Bar-Ilan University, Ramat-Gan 52100, Israel.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan. (Prof. Hiizu Iwamura, General Secretary of ISNA-6, Department of Chemistry, Faculty of Science, The University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

Calorimetry and Chemical Thermodynamics

25–28 August. International Conference on Calorimetry and Chemical Thermodynamics. Beijing, China. (Prof. Hu Ri-heng, Institute of Chemistry, Academia Sinica, Beijing, China.)

Mössbauer Effect

4–8 September. International Conference on the Applications of the Mössbauer Effect. Budapest, Hungary. (ICAME '89, Central Research Institute for Physics, H-1525 Budapest, PO Box 49, Hungary.)

Plasma Chemistry

4–8 September. 9th International Symposium on Plasma Chemistry. Pugnochiuso, Italy. (Secretariat, ISPC-9, Centro Internazionale Congressi, V. le Papa Pio XII, 18-70124 Bari, Italy.

Electrochemistry

17–22 September. 40th International Society of Electrochemistry Meeting, Kyoto, Japan. (Prof. Yasuhiko Ito, Department of Nuclear Engineering, Faculty of Engineering, Kyoto University, Sakyo-ku, Kyoto 606, Japan.)

Organometallic Chemistry

1–6 October. Fifth International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS V). Firenze, Italy. (Prof. G. Casnati, Dipartimento di Organica "Ugo Schiff", Università degli Studi di Firenze, Via Gino Capponi 9, 50121 — Firenze, Italy.)

1990

Natural Products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India. (Prof. Sukh Dev, Malti-Chem Research Centre, Nandesari, Baroda-39340, India.)

Porous Solids

6–9 May. Second International Symposium on Characterization of Porous Solids (COPS-2). Alicante, Spain. (Prof. F. Rodriguez-Reinso, Departamento de Química Inorgánica e Ingeniería Química, Facultad de Ciencias, Universidad de Alicante, Apartado 99, Alicante, Spain.)

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland. (Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany. (Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical Organic Chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel. (Prof. Yitzhak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000, Israel.)

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IUPAC Secretariat

Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF (UK)
Telephone: + 44 (865) 747744 Telex: 83220 IUPAC G Telegrams: IUPAC OXFORD
Fax: + 44 (865) 747510

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 43 countries, each represented by a national organization, such as an academy of science or research council.

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